RAILROAD GAZETTE

FRIDAY, MARCH 28, 1902.

CONTENTS

ILLUSTRATED:

The Sessions-Standard Friction Draft Gear, Type C —For Narrow Sill-Spacing 221
The Ice Gorge on the New York Central 223
Heavy Double-End Suburban Locomotive for the New York Central 225

CONTRIBUTIONS:

The First 10-Wheeler and Winan's Last "Camels" .. 219
The Miller Locomotive Cab Signal 219
Solon and His Critics 220

EDITORIAL:

The Committee Work of the Maintenance of Way Association 230
Annual Reports: Texas & Pacific: Chicago, St. Paul, Minneapolis & Omaha 231
February Accidents 231
Editorial Notes 230, 231
New Publications 231

MISCELLANEOUS:

Track 220
The Maintenance of Way Meeting 221
Exhibits at the Maintenance of Way Meeting, Chicago 222
Ballasting 222
Test of Bismarck, Washburn & Great Falls Lignite Burning Locomotive, No. 3 223
The English and the Metric System 226
Some of the Work of the Government in Cross-Tie Preservation 226
Chilled Cast Iron Car Wheels 227
Train Accidents in the United States in February .. 227
Signs, Fences, Crossings, Etc 232

GENERAL NEWS:

Technical 232
The Scrap Heap 233
Locomotive Building 233
Car Building 233
Bridge Building 233
Meetings and Announcements 234
Personal 234
Elections and Appointments 235
Railroad Construction 235
General Railroad News 236

Contributions

The First 10-Wheeler and Winans' Last "Camels."

Pittsburgh, Pa., Feb. 28, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

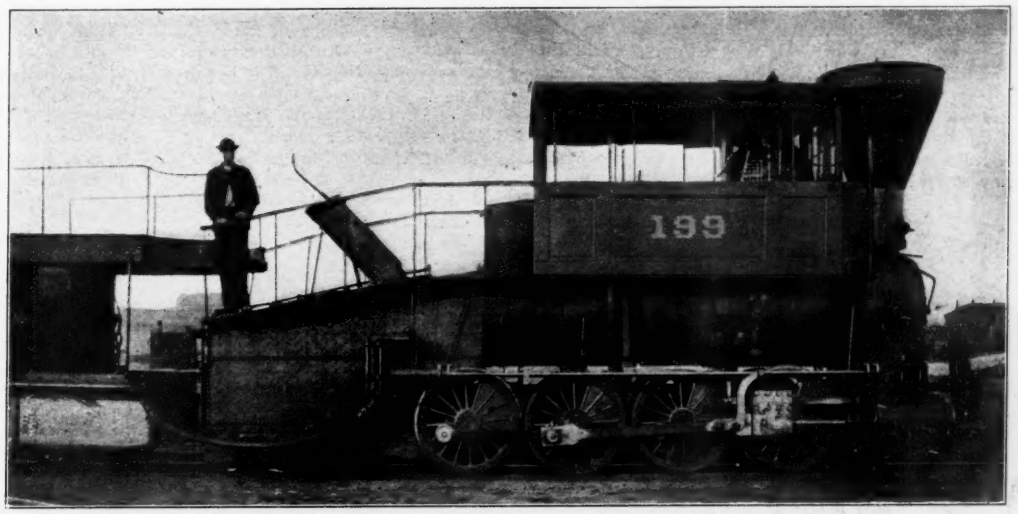
I note with regret, from the communication of Prof. Goss, in your issue of Feb. 14, 1902, as to the 10-wheel engine which was sent to Purdue, that he considers mine, referring to the same subject, to be "unncessarily severe." I can only say that it was not written in such a spirit, and that I had no thought of reflecting, either directly or by innuendo, upon Prof. Goss, for whom I entertain much respect, both personally and professionally, or upon the institution with which he is connected. I assumed the article to which I referred, to have been, as he indicates it was, merely an ordinary news item, and as such, properly subject to correction, and had I known the source from which it emanated, my criticism would undoubtedly have been more moderately expressed.

I am pleased to find my statements confirmed by Mr. W. S. G. Baker, whom I know to be fully informed, by his personal experience, as to the practice of the Baltimore & Ohio, and of Ross Winans, prior to 1860. I would, however, suggest (although not strictly relevant to the main question) that Mr. Baker is apparently in error in his statement that the Hayes 10-wheelers, which were designed in 1853, were "the first 10-wheel engines ever built." The 10-wheel engine "Chesapeake" was built for the Philadelphia & Reading by the Norris Works, of Philadelphia, and was placed on the road March 19, 1847. This engine, which was probably the first of the 10-wheel type, had six driving wheels 46 in. in diam., a four-wheeled truck with 26-in. wheels, cylinders 14½ x 22 in., and a 44-in. boiler. Again, Colburn's "Locomotive Engineering" illustrates on page 46, a 10-wheel engine, the "Yates, No. 34," of the New York & Erie R. R., which is stated to be one of a class of engines built by Rogers, Ketcham & Grosvenor, for that road, in 1848. These engines had 18 x 20-in. cylinders, six-coupled 5-ft. driving wheels, and a four-wheeled truck, and the illustration referred to is stated to have been copied from a photograph made by the author in 1851. In view of Mr. Colburn's standing as an authority on the history of the locomotive, I think it may safely be assumed that these were the first 10-wheel *passenger* engines ever built.

The accompanying photograph and line drawing, which represent one of the last lot of "camel" engines which were built by Ross Winans, may be found of sufficient interest, in this connection, to be worthy of publication. These engines were those referred to in my former communication as built in 1860 and remaining in Mr. Winans' shop until 1863, when they were bought and put in service by the Baltimore & Ohio R. R. Co. I inadvertently stated that there were four of them, but as a matter of fact, there were only three, the fourth engine, the "Centipede," being of a different type. The photograph is a reduced copy of one made in 1863 by Mr. R. K. McMurray, now Chief Engineer of the Hartford Steam Boiler Insurance Co., who was at that time Supervisor of Firemen, B. & O. R. R., and shows the engine fitted with the then standard B. & O. freight engine stack. The drawing was made by the writer and shows the Winans standard stack, which was on the engines when they left Winans' shop.

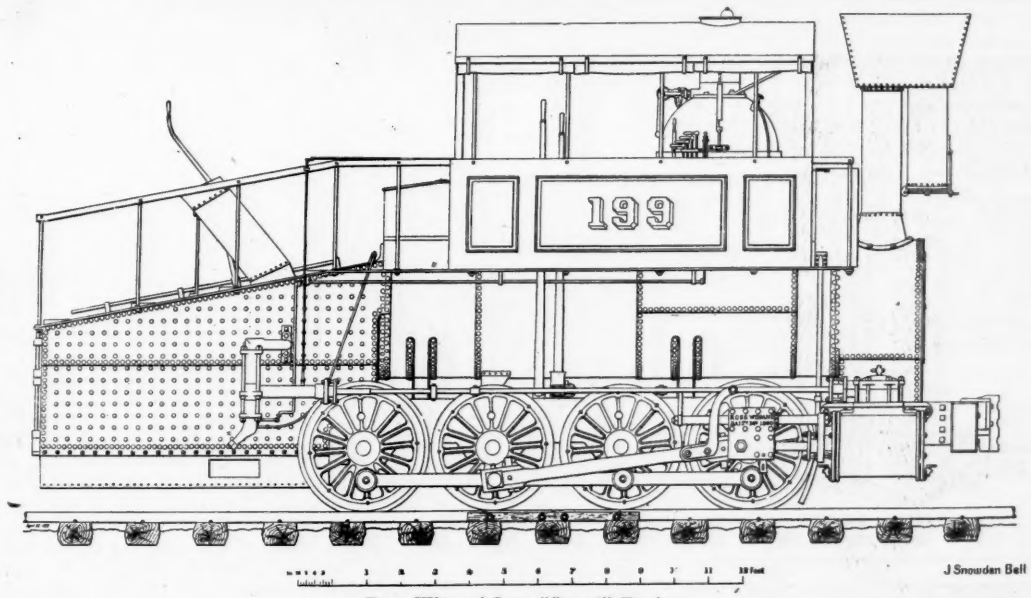
The distinctive characteristics of the camel engine appear so clearly in the illustrations that they need not be particularized. Attention may, however, be called to the single-riveted boiler, without lagging, the feed chute on the top of the fire-box, which was supplied with coal from an upper deck on the tender, the starting bar used with the drop hook valve gear, the arrangement of dome, cab, gage cock handles, and eccentric throttle lever, the chilled cast-iron tires held by hook-headed bolts, and the peculiar connection from the main rod to the pump rod.

Having in mind that these engines were the practice of 40 years ago, criticism made under the light of that of to-day, can properly respect them. No locomotive, up to their time, evinced the boldness and originality of conception which is apparent in their design, and notwithstanding



Ross Winans' Last "Camel" Engine, Built 1860, Bought by the Baltimore & Ohio, 1863.

With Baltimore & Ohio Standard Stack.



Ross Winans' Last "Camel" Engine.

With Winans' Standard Stack.

structural weaknesses and imperfections which are now clearly apparent, their performance was beyond that of their contemporaries, and they embodied features which, perfected by development, are essential factors of the success of present practice. J. SNOWDEN BELL.

The Miller Locomotive Cab Signal.

Chicago, March 22, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Our attention has been called to an article in your issue of March 14 commenting on the Miller locomotive cab signal, signed "S. A. I." We are charitable enough to believe the gentleman when he says that the article "is not intended in any way as a criticism, but merely to set forth some points which require elucidation."

The major portion of the points cited would need no explanation to signal engineers, electricians or operating railroad men, but for the benefit of the general reader we will take up the points as they are raised and do our best to make our system clear.

First, as to the insulation necessary between the wheels of the engine and of the tender, which are used to make the track connection for the engine-carried instrument (commonly termed relay). The writer is correct when he presumes that such insulation has been effected and is thoroughly practical. The double ended engine, with solid frame supporting the tank and engine, is one of the least difficult types to insulate. It must be understood that a very low insulation is all that is necessary for the operation of the mechanism. Fully 80 per cent. of the engines in use to-day could be equipped and operated without adding any artificial insulation.

The method adopted for insulating varies with the different types of engines. We cannot go into details on that subject here, but will be pleased to furnish them for any type of engine when plans of construction are submitted.

As to the engine failing to make connection with the signal rail section, on account of a sanded rail, it is a very doubtful proposition that an engine weighing 40 tons or more should cross 60 ft. of track without either the tread or the flange of one of the wheels coming in contact with the rail. If such should be the case, however, the light would not remain as last displayed "regardless of the condition of the block," but would go to the "red or stop" signal.

Next is the efficiency of a battery carried on the engine. There are a number of portable batteries on the market which are fully adapted to this work. In our own experience, "Edison Lalande" batteries charged in August, placed on the tank of engine 203, on the Chicago & Eastern Illinois, which runs one hundred miles a day, were in good condition and operated the engine mechanism successfully the following January. Several types of cells are now in use which use a semi-liquid or jelly electrolyte. It is practicable, however, to use a common so-called dry battery for this purpose. It is only a question of discharging the battery at a rate that will not produce polarization, in order to use this style of cell on a closed circuit; and we have run a four volt electric light with a battery of this type properly arranged, for 40 consecutive days.

We have never advocated the use of an electric headlight dynamo for the signal lights. We are, however, installing engines with dynamos to furnish the signal lights, but we do not use this same dynamo for an arc headlight. The causes of failure in arc headlights are eliminated from the dynamo for the signal lights by using a shunt-wound machine, and by reducing the voltage and the amperage discharge.

The next point raised is the feasibility of testing the accuracy of the signal. As the entrance of each block is marked by a post which contains the track relays, it is suggested that the engineer would naturally make the test just before he enters a block.

As to track relays being sensitive, we do not concede that such is the case. Any signal engineer that is conversant with track circuits knows that, properly installed,

the track relay is not a delicate instrument. In the case cited, where the vibration of the bridge closed the contact of the relay, with the result that a clear signal was given while a train was in the block, it is very evident that it was caused by faulty construction. We have eliminated the possibility of this occurring with our engine equipment.

The next comment is that "It would be interesting to know what provision is made for side tracks." As automatic blocking is not original with us, there being three thousand miles or more in operation in this country, it is only necessary to say that side tracks are protected in the usual manner pertaining to all automatic signaling.

"Is not the engineer the only one of the train crew who knows anything about the position of the block?" This is true in all outside signaling systems, especially in stormy or foggy weather; but with our system we also place a set of lights in front of the fireman, where he can see them at all times.

"Should an engine meet with an accident and have its cab smashed, what indication, if any, would there be to show whether the engine at the time of the accident was running with a red or white light in the cab?" This question is irrelevant to the signaling proposition. In no automatic block system would the signal behind the train indicate the conditions under which the wrecked train entered the block.

J. D. PRICE,
Engineer of Signals, Miller Signal Co.

Solon and His Critics.

Sault Ste Marie, Ont., March 19, 1902.

To the Editor of the Railroad Gazette:

I have followed with interest the communications of "Solon and his Critics." The question of the attitude of the management of a road towards the technical department, will generally be controlled by the physical conditions of the property. On a railroad located in a prairie country, where easy grades and curvature prevail, the engineer will hold a subordinate position from the very beginning, and his services will likely be dispensed with altogether as soon as construction is over, and the track work will be entrusted to a "practical man" so called: whereas on a road with contrary and adverse physical conditions, the Chief Engineer, under intelligent management, will always be a "co-ordinate" official.

No amount of scientific theory will make a good administrator, nor a good engineer, but there is no doubt that a good administrator with some technical knowledge, is preferable on a railroad, to one with none, and he will be able to judge better of the aims and methods of his subordinates.

Railroad management is becoming more and more a scientific attainment, and with competition, a close financial study to maintain low rates and still pay interest on the cost of the road. Men who bring to this task a knowledge of the road's physical conditions and of the laws which govern the forces of nature and finance, will stand a better show of success than those who have worked their way up from brakemen, firemen, enginemen, etc., unless they have obtained technical training either before or during their term of service.

I am well aware that many railroad men think of engineers as a class of men full of theory and of "studious habits," men with small practical knowledge and who, on this account, are barred from the practical and successful pursuit of any commercial enterprise; that this is far from right, nothing shows better than the management of nearly all large bridge companies. However, it cannot be maintained that the engineer makes the best administrator simply for the reason that he is an engineer, but having the individuality to make an administrator, he will be able to render better service to his road for having had technical training. That this is a fact nothing shows better than the management of America's greatest railroad property, the Pennsylvania.

New conditions will bring to the fore new classes of men; in the future when the carrying trade will become more competitive, the man with the commercial instinct who goes forth to battle for his road's share of business will become the all-important factor, the very soul of the enterprise; to argue that this official's doings would not be the more rational by being guided by a knowledge of the operating problems involved, would be as fallacious as the argument that the operator is not better for having had technical training.

G. W. S.

Track.*

This committee in its report considers the following sub-divisions of its subject: Maintenance of line; maintenance of surface; maintenance of gage; inspection of track and track tools. These are all discussed in detail.

Maintenance of Line.—Adjustment of curves, with consideration as to easement curves: Recommendation: Easement curves shall be used as follows: For roads not exceeding speed of 30 miles per hour, on all curves exceeding 2 degs. For roads not exceeding speed of 60 miles per hour, on all curves exceeding 1 deg. For roads where higher speed is attained, on all curves exceeding 0 deg. 30 minutes. Easement curves shall be used between curves of different degrees in the same way that they are used between curves and tangents.

The length of easement curves shall be the same as the distance in which the curve elevation is run out; therefore, as the super-elevation of curves depends not alone on the degree, but also on the speed of trains, the length of the easement curve should vary in the same manner.

For ordinary practice, a chord length equivalent to 100 feet for each degree of variation in curvature is recommended.

Where the distance between curves will not allow this, or for other reasons, a chord length of 25 to 30 feet may be used.

For very high-speed roads, a chord length equivalent to 150 ft. or more per degree of variation is recommended.

The Committee believes that any form of transition curve is satisfactory which gradually changes the degree of curvature, and in which the length of chord per degree of variation can readily be changed to suit each particular case, the essential point being that the length of the easement curve shall be the same as the distance in which the super-elevation of curve is raised from 0 to full elevation. We recommend any transition curve of the Searles, Crandall, Holbrook, or cubic parabola type, which shall be susceptible of being run in by deflection or offset.

Maintenance of Surface.—Elevation of curves, with special consideration as to amount and beginning and end of elevation, and as modified by location of curve and conditions of traffic:

Recommendations: The inner rail shall be maintained at grade.

The Committee advises that the approximate formula,

$$E = \frac{G\ V^2}{32.16\ R}$$

in which,

E = elevation in feet,
G = standard gage, 4.708 feet,
V = velocity in feet per second,
R = radius of curve in feet.

will give essentially correct theoretical elevations for the outer rail of curves, and is recommended for ordinary practice, but must be modified to suit special conditions.

This formula will give results which are expressed in the accompanying table, and are recommended for use, with the modifications given below:

Velocity in Miles per Hour.

Deg.	10	15	20	25	30	35	40	45	50	55	60	65	70	Deg.
1	1/16	1/8	1/4	3/8	5/8	13/16	1	1 3/8	1 5/8	2	2 3/8	2 3/4	3 1/4	1
2	1/8	1/4	1/2	7/8	1 1/4	1 7/8	2 1/4	2 7/8	3 1/4	4	4 3/4	5 1/2	6 1/2	2
3	1/4	1/2	3/4	1 1/4	1 3/4	2 3/8	3 1/8	4	4 7/8	6	7 1/8	8 3/8	...	3
4	1/4	5/8	1 1/8	1 5/8	2 3/8	3 1/4	4 1/4	5 3/8	6 3/8	8	....	....	....	4
5	3/8	3/4	1 1/8	2 1/8	3	4	5 1/4	6 5/8	8 1/4	....	....	....	....	5
6	1/2	1	1 3/8	2 1/2	3 1/2	4 7/8	6 1/2	8	....	....	....	....	....	6
7	1/2	1 1/8	1 7/8	2 7/8	4 1/8	5 5/8	7 3/8	....	....	....	....	....	....	7
8	5/8	1 1/4	2 1/8	3 1/2	4 3/4	6 1/2	8 3/8	....	....	....	....	....	....	8
9	5/8	1 3/8	2 3/8	3 3/4	5 3/8	7 1/4	....	....	....	....	....	....	....	9
10	3/4	1 1/2	2 3/4	4 1/8	5 7/8	8 1/4	....	....	....	....	....	....	....	10
11	3/4	1 1/2	2 7/8	4 1/2	6 1/2	8 7/8	....	....	....	....	....	....	....	11
12	7/8	1 5/8	3 1/8	5	7 1/8	....	....	....	....	....	....	....	....	12
13	7/8	2	3 1/4	5 1/8	7 3/4	....	....	....	....	....	....	....	....	13
14	1	2 1/4	3 1/2	5 1/2	8 3/8	....	....	....	....	....	....	....	....	14
15	1 1/8	2 1/8	3 1/2	6 1/4	8 7/8	....	....	....	....	....	....	....	....	15
16	1 1/8	2 1/8	4 1/4	6 7/8	....	....	....	....	....	....	....	....	....	16
17	1 1/4	2 3/8	4 1/2	7	....	....	....	....	....	....	....	....	....	17
18	1 1/4	2 3/4	4 3/4	7 1/2	....	....	....	....	....	....	....	....	....	18
19	1 3/8	2 7/8	5	7 7/8	....	....	....	....	....	....	....	....	....	19
20	1 3/8	3 1/8	5 1/4	8 1/4	....	....	....	....	....	....	....	....	....	20

Since the elevation required is a function of, and depends upon, the train speed, this speed is the first element to be determined. In general, as a matter of safety, the preference should be given to fast passenger traffic. The slower freight traffic must also be considered, and it often happens that on freight lines the correct elevation for passenger service would be so excessive for freight service that the train resistance would be increased enough to materially reduce the tonnage hauled. In this case, a compromise must be made between the two rates of speed, and the curve elevation used will be too small for passenger service (theoretically), but practicable for freight service. When the theoretical elevation is reduced the speed of passenger trains should be correspondingly reduced. This is a problem which must be decided on each road, according to the relative importance of its freight and passenger traffic.

It must not be understood that it is unsafe to run over a curve at a higher rate of speed than that for which it is elevated. A train may safely run 10 miles per hour over a curve which has no elevation. In the same manner a train may safely run 60 miles an hour over a curve elevated for a speed of but 50 miles an hour. Such an extreme should be avoided. It results in increased flange and rail wear and cost of maintenance. The curve can never ride perfectly and the danger of accident is increased. The maximum allowable elevation of curves depends entirely on local conditions. On fast passenger roads, where crushed stone or other stiff ballast is used, a difference in elevation of 8 in. is successfully maintained, but the Committee recommends that for ordinary practice a maximum elevation of 7 in. shall be used, and that when greater elevation is required, speed shall be reduced until the 7 in. elevation gives satisfactory results. The super-elevation of curves shall be zero at the point of spiral and shall increase to full elevation at the end of the spiral or point of simple curve. In ordinary practice, it is recommended that the elevation be run out at the rate of 1 in. in 60 ft., but this will be modified by the same conditions that should vary the length of the easement curve used.

Vertical curves shall be used wherever changes occur in the rate of grade.

This report is signed by W. B. Poland, B. & O. S. W., Chairman; W. M. Camp, *Ry. & Eng. Review*, Vice-Chairman; S. B. Fisher, M., K. & T.; C. L. Addison, Long Island; F. R. Coates, C. G. W.; D. MacPherson, C. P.; C. E. Lindsay, N. Y. C. & H. R.; H. C. Landon, Buffalo & S.; A. W. Fiero, Chicago, Ill.; G. A. Mountain, Canada Atlantic; C. E. Bryan, B. & O.; W. H. Davisson, C., R. I. & P.

Abstract of Discussion.

The several recommendations of the committee were passed on separately. Only those resulting in important modifications or important discussions are included here. In the case of many detail points, it was decided to postpone final action until next year.

Mr. Cushing: I would like to ask in regard to the last paragraph and the recommendations printed in the smaller type, "For very high speed roads, a chord length equivalent to 150 ft. or more per degree of variation"—I would like to have some reasons presented.

Mr. W. B. Poland (B. & O. S. W.): In dealing with spirals it is necessary for us to have some way of measuring or designating a spiral. There are many different kinds of spirals worked out from so many different theories, which, as a matter of fact in practical application approach each other so closely, that it seems to me that we can designate the spiral satisfactorily by its chord length, and meaning by that chord length such a distance as is required to vary the rate of curvature one degree. The designation of a curve by degrees is, of course, customary. That means that the deflection is so many degrees in a chord length of 100 ft., or that the central angle of the subtangent is a certain amount. Now, in discussing spirals we must adopt some measure of the spiral, and the one that has appeared to your committee most satisfactorily and easily understood is to designate it by its chord length, that is the distance in which there is a variation of one degree in the rate of curvature, and that is what is meant when we say that we should for ordinary curves use a chord length of 100 ft. We mean that in a distance of 100 ft. the rate of curvature should vary one degree, and if we say a chord length of 50 ft. we mean that in the distance of 50 ft. the rate of curvature shall vary one degree, and if we say a chord length of 150 ft. we mean that in the distance of 150 ft. the rate of curvature shall vary one degree. I know of no other way of satisfactorily designating a spiral than by this chord length variation. That does not mean at all that the chord shall be staked out in those distances. Because you have what you might call a 50 ft. spiral does not mean that you should put stakes in for 50 ft.; you could put them in for 10, 15 or 25 ft. any distance you want.

Mr. A. Torrey (Michigan Central): I do not see anything in these recommendations indicating that on a double track road any different policy should be pursued in preparing the curves. I think there is no question but that the superelevation should be less as you approach the curve than as you leave it to produce the same sensation. The easement at the remote end of the curve can be shorter and at the same speed than the easement at the entrance.

Mr. J. H. Abbott (B. & O.) May it not be that the speed of the train is reduced somewhat in passing around the curve? Now, in practice on the single track road, I am connected with, for high degrees of curvature I do not use the same calculated elevation as I do on the lighter degrees. The sharper curves reduce the speed of trains, and I use 40 miles an hour for up to four degrees of curvature, and then I have a system of dropping the elevation off, figuring on the sharper curves, which run up as high as 8 degrees curvature; of course, too much for trunk lines. And I have noticed that same thing in regard to leaving a curve.

Mr. Hunter McDonald (N. C. & St. L.): I ask if the Committee considered the best way of establishing the permanent witnesses, whether to put them in the center of the track or at the side? I notice they are silent on that point.

Mr. Poland: That subject was considered in the committee meeting, and it was thought best not to go into that detail. Local conditions would vary so much that it was considered it might not be best to make a specific recommendation as to how such centers should be established. Probably the way it would be most usually employed would be to set the witnesses in the center of the track, because they are available and easy to set. A monument on the side of the road was considered, but a good many embankments would be so likely to settle that we thought that it would not be proper to recommend that monuments be put on the side because it would not apply to all cases, and the man would invariably be governed in establishing monuments by his local conditions, so that it did not seem necessary to specify as to what sort of a permanent mark should be used. We maintain that a permanent mark should be used at such points that the line could be accurately re-established by the use of a transit.

Mr. Poland: It would possibly be proper for me to say a few words in regard to the elevation of curves. The recommendation of the Committee was first given here that the lower rail should be maintained at grade. The Committee recognizes the fact that that is not theoretically correct. The theoretically correct method of elevating curves would be to depress the inner rail and elevate the outer rail, the point being that the ideal condition should be one in which the center of gravity of the train would not be disturbed in passing around the curve; that is, that no work would have to be done on

*Extracts from the Report of the Committee of the American Railway Engineering and Maintenance-of-Way Association.

the train in inclining it as it follows around the curve, to give the necessary elevation. But, practically, the amount which the low rail should be depressed is less than the amount which the high rail should be elevated, and for other practical considerations in the field work your committee considered that equally good results would be obtained by holding the inner rail at grade and elevating the outer rail. We recognize the fact that in very sharp curves it might be necessary to depart from this. The attention of your committee was called to one particular curve where an 8-in. elevation was used, where it had been necessary, in order to get a good riding track, to lower the inner rail; but we consider, as a general proposition that it would be perfectly satisfactory to hold the inner rail at grade and it is the best rule to follow in general. The formula given is not theoretically correct, but is so closely correct that your committee considered that it was practically applicable in all cases; that is, a slight variation in the speed of the train would make so much more variation in the elevation in the outer rail than would be occasioned by the difference between the use of this formula and the theoretically correct formula, that we considered that it could be disregarded and this formula used.

Mr. Cushing: I feel that the Committee has been a little conservative in recommending a maximum elevation of 7 in. Eight inches is being very largely used and is perfectly safe and convenient. It allows for much better regulation in regard to speed, and I would be in favor of changing the 7 in. to 8 in. I have known of cases of passenger tracks to be elevated 9 in., and I think 8 in. is perfectly safe and within reason; and I suggest that be the figure instead of 7 in.

Mr. Poland: I would only call attention to the fact that the statement is made here that for *ordinary* practice 7 in. is recommended. Your Committee considered the extreme elevations that are frequently used. They are used, I presume, only on strictly passenger roads and under special conditions. It would be perfectly satisfactory to the Committee to change that to 8 in., if the sense of the meeting is that an elevation of 8 in. could be considered ordinary practice.

Mr. Cushing: I heartily appreciate what the Chairman of the Committee says in regard to "ordinary practice." What I recommend is certainly ordinary practice on the Pennsylvania Lines anyhow. I think that it is good for any road that wants to maintain a speed of at least 45 miles an hour, because many roads have 6 deg. curves and 8 in. is the elevation for a 45-mile an hour speed. I do not think that is an excessive elevation for almost any road running pretty good passenger service. These curve elevations are on both freight and passenger tracks, both kinds of traffic pass over them, and they are entirely practicable and satisfactory. Seven inches seems to be on the wane, not going quite to the extent that is known to be perfectly good, ordinary practice.

Mr. C. S. Churchill (N. & W.): While this matter is up I wish to bring up another point that is raised in connection with this. The question is how high can you get the elevation and not cause trouble with your freight trains, if you are running passenger and freight trains on the same track? I do not know why it should be so, but it seems from the movement of freight cars, going down on their side bearings, there is some argument that can be brought to bear on having the elevation a little low rather than high in the case of freight trains. But the principal matter in my mind is that I would like to have some light on the point whether there is an increase in train resistance due to the fact that you have a little more elevation than the particular train in question requires. Your freight train runs 10 miles an hour, and your passenger train runs 40 miles an hour. By putting a 7-in. elevation in your track, are you bringing too much train resistance on your freight train? That is a live question for those handling freight.

Mr. Abbott: Six inches is our maximum elevation on a coal road. Our passenger trains run 40 and 45 miles an hour around six degree curves, and yet with that elevation our inside rail, 80 lbs., and a little bit soft, has formed a lip on the outside of the rail showing a sliding of the wheels of our freight trains down the incline of 6-in. elevation, and it is a serious question whether we should not reduce our elevation rather than make it greater. I bring that up as an experience.

President Kittredge: Is there any further discussion on the amendment to substitute 8 in. for 7 in. as the maximum elevation? (The motion was put and carried.)

Mr. Churchill: I hope my point will be considered before this matter is finally decided.

Mr. Poland: The object in elevating the curve, as your Committee understands it, is to insure that the reaction through the center of gravity of the train is the resultant action, which is a combination of the centrifugal force and the gravity, shall be normal to the plane of the track. It is to accomplish this that the curve is elevated. Now if your curve is not elevated correctly and it is elevated too much, the centrifugal force forces the wheels against the outer rails. If the elevation is too little the gravity component forces the flanges of the wheels against the inner rails. In either case, if it is not correctly elevated there must be more work expended in pulling the train around the curve than if it were correctly elevated. That seems to me so self-evident a proposition I cannot see where any discussion should come in on it. That is, if your curve is not correctly elevated you must necessarily be doing more work to pull the train around the curve, and it follows if you are hauling a freight train around a curve which is elevated for passenger traffic, it is elevated too high for the freight train, and therefore you are doing more work in pulling it around.

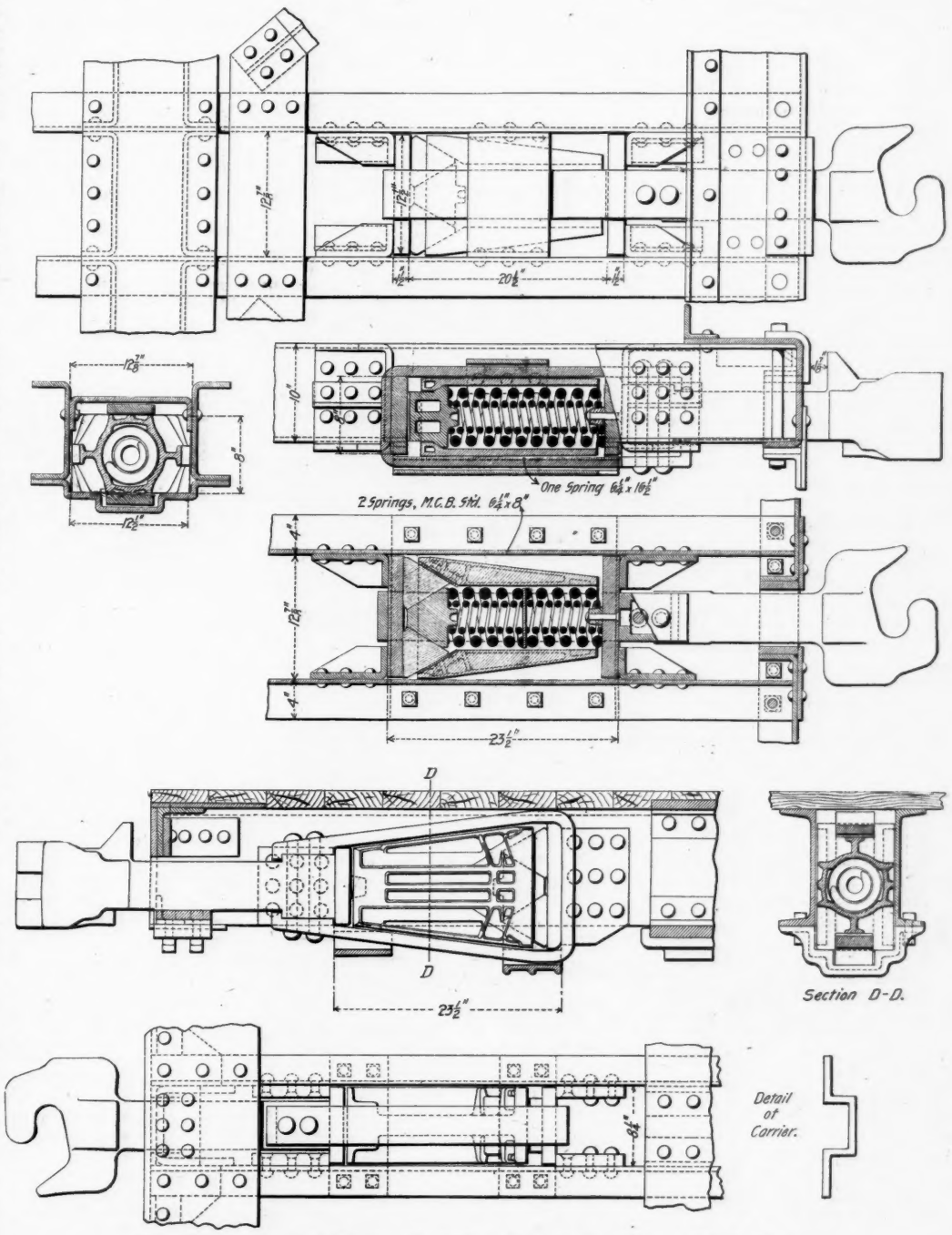
Mr. Churchill: My question is answered, except that the answer leaves out the important element of friction of the wheel flanges on the track. But as a matter of fact the friction of the flanges of the wheel on the outer rail is actually decreased by a little superelevation, and the result is if there is superelevation, that is too much elevation for freight trains, it is not injurious because a freight train will move a little easier. We all have observed that the lower rail forms a lip on the outside, often, and that is due to the extra weight brought on the low rail by the freight train. But at the same time I think we have observed that there is no material wear on the inside rail produced by the flange.

The Sessions-Standard Friction Draft Gear Type C—For Narrow Sill-Spacing.

The Sessions-Standard Friction Draft Gear, Type C, as made by the Standard Coupler Co., New York, and illustrated in the *Railroad Gazette*, November 29, 1901, was designed to go between draft sills spaced 12⅞ in. minimum. In meeting the needs of some special sill construction, it was found desirable to adapt the draft gear to a narrower sill space and, this being done, its advantages for all work were at once apparent. The device as here shown has been made standard for all classes of cars. The spring barrel has been made to go in a sill space of 8¼ in. minimum, without materially altering the design. There is no change in the mechanical action or in the interior of the spring barrel and its acting parts. The ribs on the exterior of the spring barrel have been arranged as shown in the detail illustrations.

It will be seen from these drawings that the mouth of the casting remains the same as before illustrated, and that the opposite end has been reduced by removing the projecting flange and supplying chafing surfaces where the spring barrel is in contact with the strap when the gear is placed in a narrow sill space. When so placed, the long axis of the bell-mouth of the spring barrel is vertical, instead of horizontal, as would be the case where sills are spaced 12⅞ in., or more, apart.

This draft gear has apparently enlisted the favorable opinion of a number of prominent motive power men. Thus far, eighteen hundred sets have been ordered, divided among several prominent railroads.



The Sessions-Standard Friction Draft Gear Type C—For Narrow Sill-Spacing.

The Maintenance of Way Meeting.

The third annual meeting of the American Railway Engineering and Maintenance of Way Association was held at the Auditorium Hotel, Chicago, on March 18, 19 and 20. The attendance was about 140 and two sessions were held each day.

Mr. G. W. Kittredge, of the Cleveland, Cincinnati, Chicago & St. Louis, (President of the Association) opened the meeting at 9:30 o'clock Tuesday morning and the following are brief extracts from his opening address:

PRESIDENT'S ADDRESS.

Your directors have held frequent meetings during the past year which have been reasonably well attended. They have tried to keep in touch with the work of the various committees and profiting by the experience of former years, have tried to get reports formulated in such a manner that only such branches or portions of subjects should be handled as could be fully considered and carried down to definite conclusions. Some reports must of necessity be reports of progress, but so far as it has been practical to do so, you will this year find that the reports contain a certain number of conclusions upon which you can act as a body. Efforts have been made to have the reports so handled that they shall truly be the reports of committees and not of individuals. . . .

We have found in dealing with our committees what we so often find in carrying on our daily work, that there are two kinds of leaders; the one kind that can and does do most of the work itself, and the other kind that can make some one else do it. And as is usually the case when measured by results, the latter is the smarter. It

is within the power of those who have reports in charge to yield a great force, and its duties should be entered upon soberly, advisedly. This Association has a right to expect a complete, full and a prompt handling of the subjects submitted, and it should not be satisfied with anything less. It is encouraging to feel that the high executives of the railroads look with favor upon our organization and with interest upon our meetings, discussions and publications.

It should be our earnest wish and aim that our meetings, our deliberations and our discussions here may be conducted on a broad and intelligent basis, with calmness and with thoroughness, so that when we depart, the younger and the older ones among us may all feel that we have learned something, and that the decisions reached and the recommendations made are authoritative and of value to us in planning and carrying out our work so that the results may prove satisfactory to ourselves and to the railroad companies whose interests we serve.

The Secretary and Treasurer reported that the balance on hand at the time of the last meeting was in round numbers $2,117; the receipts during the year have been $6,290; the expenditures have been $6,030, leaving a balance on hand now of $2,377. The membership at the time of the last meeting was 359, and now it is 406.

The following officers were elected:

President—G. W. Kittredge (re-elected).
First Vice-President—A. W. Sullivan.
Second Vice-President—Hunter McDonald.
Secretary—L. C. Fritch (re-elected).
Treasurer—W. S. Dawley (re-elected).
Directors to serve three years—F. H. McGuigan (re-elected) and A. W. Johnston.

Some of the committee reports were printed last week and others appear this week. What we print now and hereafter will be as independent articles, each report with its discussion.

Exhibits at the Maintenance of Way Meeting, Chicago.

The exhibits at the third annual meeting of the Railway Engineering and Maintenance of Way Association, installed in one of the large parlors of the Auditorium Hotel showed a considerable increase in number ove those of last year. Nearly all of the houses exhibiting a year ago had space again this year. In most cases appliances were represented by small models. though there was a large number of actual machines and devices on hand. A list of the exhibits follows:

Abbott, Franklin E., Chicago.—Full sized and small models of Abbott's bridge joint plate.

Albrecht, John, Massillon, Ohio.—Small models showing combined metal tie and chair.

The American Nut & Bolt Fastener Co., Pittsburgh, Pa.—Bartly nut and bolt fastener; rail joint (full size). Photographs.

American Steel & Wire Co., Chicago.—Sample of steel wire fencing.

American Track Barrow Co., Lowell, Mass.

American Washer & Mfg. Co., Chicago, and Newark, N. J.—Ward rail joints, Ward adjustable insulating joints, Harvey rib, Ajax tail, nut-locking washers and plain coil washers from ⅜ in. to 3 in.

Art Metal Construction Co., The, Jamestown, N. Y., and St. Louis, Mo.—Cold rolled steel office and bank furniture, vertical letter files, card index, tray and document file; album of photographs.

Atlas Railway Supply Co., Chicago.—Full sized models of rail joints, showing standard rail, insulated and step joints, drawings, etc.

Avery Stamping Co., The, Cleveland, Ohio.—The Chester metal tie, heavy pressed metal work, samples of tie plates.

Bonzano Rail Joint Co., Philadelphia, Pa.—Full sized and small models of Bonzano rail joint.

Buda Foundry & Mfg. Co., Harvey, Ill.—The Bogue & Mills railroad gate; line of Paulus track drills and pressed steel hand car wheels.

Cambria Steel Co., Philadelphia, Pa.—Full sized model of the "100 per cent." rail joint. Blue prints and cuts.

Chicago Crossing Co., Chicago.—Ball track joint, Ball spring tie plate and Ball spring fasteners.

Climax Stock Guard Co., The, Chicago.—Samples of vitrified clay stock guards. Photographs.

Continuous Rail Joint Co. of America, Newark, N. J.

Dilworth, Porter & Co., Ltd., Pittsburgh, Pa.—Glendon flange tie plate, Goldie claw plate and Goldie "Perfect" railroad spike.

Dixon Crucible Co., Jersey City, N. J.

Dodson Signal Lamp & Lantern Co., Scranton, Pa.—Line of railroad signal lamps and lanterns.

Drexel Railway Supply Co., The, Chicago.—Blue prints and catalogues showing Gibraltar bumping posts. Full sized model of "G. L. M." switch stand.

Edison Mfg. Co., New York and Chicago.—Edison primary batteries. Exhibit of "R.R." and "S.S." types of batteries and gas engine batteries.

Elliott Frog & Switch Co., St. Louis, Mo.

Eyeless Tool Co., The, New York.—Eyeless steel picks, Servis nut locks, railroad and mining tools. Exhibit of eyeless steel picks and Servis nut locks.

Fairbanks, Morse & Co., Chicago.—Catalogues, photographs and descriptive matter of coaling stations, gasoline engines, air compressors, track appliances, etc. Small models of Barrett track jacks and rail benders.

Goldie & Co., Wm., Jr., Pittsburgh, Pa.—Samples of Goldie "Perfect" tie plugs.

Goodwin Car Co., The, Chicago and New York.—Working model of Goodwin air-operated gravity dump car; full sized drawing of section of car bolster; photographs.

Handy Car Equipment Co., The, Chicago.—Full sized sample Snow replacer.

Holman Railway Tracklayer Co., D. F., Chicago.—Large water-color picture of the Holman tracklayer in operation.

Hubbard & Co., Pittsburgh, Pa.—Line of track shovels, locomotive scoops and railroad track tools.

Hussey, Binns & Co., Ltd., Pittsburgh, Pa.—Line of shovels, spades and scoops.

Illinois Malleable Iron Co., Chicago.—Small working model of Westmark flue rattler; model of the "Bruyn" automatic swinging smoke jack.

Ingersoll-Sergeant Drill Co., New York.—Photographs, catalogues and pamphlets of air compressors, rock drills, etc.

International Acheson Graphite Co., Niagara Falls, N. Y.—Producing Acheson graphite from anthracite coal in electric furnace. Jars showing stages of process and different grades of product.

Johnson, O. W., Oak Harbor, Ohio.—Wooden model of new car replacer. (Full size.)

Jones National Fence Co., Columbus, Ohio.—Samples, catalogues and drawings of fencing and gates.

Kimball, Doyle & McWain, Detroit, Mich.—Concrete ties. (Full size.) Illustrated in *Railroad Gazette*, March 14.

Kinnear Mfg. Co., Columbus, O.—Sample section of steel rolling door, also photographs of buildings equipped with steel rolling doors and shutters.

H. Kurtz & Son, Sac City, Iowa.—The "Special" car mover. (Full size.)

Lidgerwood Mfg. Co., New York and Chicago.—Photographs of hoisting machinery, winches, unloaders, etc.

Link-Belt Machinery Co., Chicago.—Full size link-belt carrier for locomotive coaling stations, samples of Renold silent chain gear; photographs of locomotive coaling, cinder and sand stations.

Loss, Edward, Elgin, Ill.—"L. & S." anti-rail creeper.

Lowe Bros., Dayton, Ohio.

Ludlow Supply Co., Cleveland, Ohio.—Track drills, cranes and full sized models of rail joints.

Ludowici Roofing Tile Co., Chicago.—Terra cotta roofing tile for railroads and other structures and glass tile for skylights.

Lufkin Rule Co., Saginaw, Mich.—Comprehensive display of measuring tapes.

McKelvey Concrete Machinery Co., Chicago.—Small sized working model of concrete mixer.

MacPherson Switch & Frog Co., Niagara Falls, N. Y.—Small working model of MacPherson switch and frog, photographs and descriptive matter. Model of Rowland's one-piece frog clamp, Rowland's one-piece head chair and MacPherson unbroken rail joint.

Merrill-Stevens Mfg. Co., Kalamazoo, Mich.—Models of Cook's special cattle guard and of steel guards.

Morden Frog & Crossing Works, Chicago.—Small model of crossing and frogs; samples of duplex guard rail clamp. Union track jack and adjustable switch rod with open side sockets.

Morrill, Chas., New York.—Pearson "Cyclone" spike puller.

National Lock Washer Co., The, Newark, N. J.—Samples of lock washers with nuts locked in place.

Otto Gas Engine Works, The, Chicago.—Photographs and blue prints of water stations, coaling plants, etc.

Overholt Railway Signal Co., Chicago.—Model of signal plant.

Page Woven Wire Fence Co., Adrian, Mich.

Paige Iron Works, Harvey, Ill.—Photographs of frogs, switches and track material.

Pannell Gate Crossing Co., St. Louis, Mo.—Small working model of gate crossing.

Pennsylvania Steel Co., Steelton, Pa.—Models of split switches, re-enforced split switches with adjustable connecting bar, spring rail frogs, switch stands, etc.

Pettibone, Mulliken & Co., Chicago.

Poage Mfg. Co., The J. N., Cincinnati, Ohio.—Water columns, automatic with rigid or adjustable spouts, tank valves, float valves, switch stands, etc. Full sized water column on exhibition.

Railroad Supply Co., Chicago.

Ramapo Iron Works, The, Hillburn, N. Y.—Model of automatic safety switch and stand.

Roberts Car & Wheel Co., Three Rivers, Mich.

Scherzer Rolling Lift Bridge Co., The, Chicago.—Large album of photographs of Scherzer rolling lift bridges.

Slocomb & Co., F. F., Wilmington, Del.—Sample Caskey portable pneumatic punch.

Spirittine Chemical Co., The, Wilmington, N. C.—Samples of wood after being treated by the Spirittine preserving process.

Stickney Co., Chas. A., St. Paul, Minn.—Catalogues of gasoline engines, showing power engines and pumps.

Taylor Signal Co., Buffalo, New York, Chicago and St. Louis, Mo.—Complete interlocking plant for single-track, lap-siding arrangement with high signal and dwarf signal; also various appliances such as motor, switchboard and instruments, and typical installations. Diagrams.

Tiffany Enameled Brick Co., Chicago and Momence, Ill.—Exhibit of enameled brick and tile.

United States Supply Co., Richmond, Va.—Model of the Graham combination guard rail and frog brace, and full sized frog brace.

Variety Mfg. Co., Chicago.—Working model of Cross horizontal folding door; catalogues and photographs.

Verona Tool Co., Pittsburgh, Pa.

Wallace Supply Co., The, Chicago.—Petroleum Buckeye light, tire expander, locomotive fire kindler and paint burner.

Waterbury Tool Co., The, Waterbury, Conn.—Line of Williams universal ratchets. (Two sizes.)

Weber Railway Joint Mfg. Co., New York and Chicago.—Full sized and small models Weber insulated, compromise and standard joints.

Whall & Co., G. H., Boston, Mass.—Samples of Whall's insulating fiber for track joints and Whall's fusee for flagging trains.

Ballasting.*

This report states that the materials which best fulfill the requirements for ballasting are broken stone, gravel, coarse sand, burnt clay, partially disintegrated rock, slag, cinders, and various products resulting from the separation of ores, such as chatts, Joplin gravel, etc. A brief discussion of the merits of each is given, and this is followed by statements regarding the requirements of the sub-grade or roadbed, and the conditions that make a sub-ballast necessary, with a suggestion concerning satisfactory materials for the latter.

Recommendations for depth of ballast give a minimum of 8 in. with an average of 12 in. Recommendations for cross-sections assign the minimum dimensions to rock ballast and the maximum to the light materials such as chatts, coarse sand, etc., in which the ties should be buried to prevent the track from being too easily thrown out of line.

This report is signed by E. Holbrook, Kansas City Southern, Chairman; F. A. Molitor, Choctaw, Oklahoma & Gulf, Vice-Chairman; H. U. Wallace, Illinois Central; C. B. Hoyt, New York, Chicago & St. Louis, and John V. Hanna, St. Louis & San Francisco.

ABSTRACT OF DISCUSSION.

Mr. H. C. Phillips (Santa Fe): The use of burnt clay is spoken of. Can any member of the committee give me the weight, per cubic yard, which that averages? The reason I ask is that we have used burnt clay, which has run as low as 1,800 lbs. per cu. yd. We have not had satisfactory results with it. We are led to believe that other roads are using heavier clay and that it is working well.

Mr. Dauchy (Rock Island): Our experience is that if you get the right kind of material in burnt clay it makes an excellent ballast; but if you do not get the material in its proper form it does not give satisfactory service. As to weight of material, of course the nearer pure clay or gumbo is obtained, the heavier ballast it makes, and the heavier the ballast is the more satisfactory service it will give. I notice an item in the report with reference to burnt clay which states, "Clay containing little sand and a sufficient quantity of fluxing material to produce a semi-vitreous mass has undoubtedly made a fairly good ballast." This is contrary to our experience with burnt clay ballast. The fact that it has any sand in it at all usually destroys its virtue for the purpose for which it is intended. The cause of all the trouble we have had with burnt clay ballast is this question of sand.

Mr. E. E. Hart (Nickel Plate): In 1895 and '96 I was division engineer on the Southern Division of the Burlington road. I had charge of burning three pits, one at Table Rock, and two on the main line near Hastings. The pits near Hastings were pure clay, with no vegetable matter introduced into the clay. The one at Table Rock was composed of sand and washings from the Omaha River. The two pits near Hastings did not give the quality of ballast which we obtained from the one at Table Rock. We thought it was due to insufficient burning. We suppose that the coal did not furnish enough heat to burn it thoroughly, while the Table Rock pit was full of vegetable matter, such as leaves which were washed down by the river and deposited on the gravel. This pit gave first-class ballast, vitrified, red and hard. I understand they have since burned another pit of 100,000 yds. of this same material at the same place.

Mr. F. H. McGuigan: During my connection with the Wabash lines west of the Mississippi River I had charge of burning something over 3,000,000 cu. yds. of clay for ballast. Where there was any considerable quantity of sand we got a poor ballast. It had a tendency to smother the fire. We got the best results from an almost absolutely pure clay. The vegetable matter, I presume, has some advantage in contributing to the heat, but our greatest difficulty was in trying to hold the contractor to his specifications, which required that each ton of slag coal should give us five cubic yards of ballast. The result was that there was not sufficient coal to burn the clay well. We eased off on that specification a little bit, and we got on an average for one year, of which we kept an account, 4⅖ yards of ballast to each ton of coal burned, and a very good ballast. We ballasted very heavily, using an average of fully 3,000 yds. to a mile of single track, and our weights averaged from 1,550 to 1,675 lbs. per cubic yard; the latter was the heaviest ballast we laid. I should say an average of 1,625 lbs. would be about the average. We found that where the ballast was well burned, hard, that it gave very good results. On curvatures above two degrees we felt that it was a little light, but it held the track in line. But in curves under two degrees we do not have any trouble. When the track settled we probably had 10 in. of ballast all the way through, with a heavy shoulder. We put a heavy shoulder on for the purpose of retaining the line. I think in that section of the country that from 1,625 to 1,650 lbs. would be an average weight per cubic yard of ballast. The well burnt ballast was lighter than that which was poorly burned.

Mr. W. L. Breckinridge (C. B. & Q.): We had a good deal of trouble because the contractors would not put enough coal on the fires to properly burn the clay, and when they used as little as one ton of coal for five yards of ballast, the ballast was poorly burned, and the railroad company lost in the end. Our experience leads us to expect one ton of coal to burn only four yards of ballast. We have contracts for about 250,000 yds. of ballast a year, and we select pits where there is no sand. The ballast in the bottom-lands is free from sand, and is a ballast of good quality, large size and bright red color. On the higher lands it gives a paler color and does not look as well, but I suppose it is about as good.

Mr. Hart: On the Burlington road, at Table Rock, it costs 24 cents for burning, and costs 95 cents on the track; with a haul not exceeding 40 miles.

Mr. W. C. Cushing (Pennsylvania Lines West): Under the article on "Stone," page 1, I would say that I do not believe that hard sandstone, whether wet or dry, having 95 per cent., or any other per cent. of silica, will make a good ballast. I have seen the hardest sandstone which I believe is in the country anywhere, and I know from experience it is absolutely unsuitable for ballast. I would, therefore, be very sorry to see the Association approve of a ballast of that kind, provided the general experience of the rest of the members is the same as mine has been with reference to it. I therefore make a motion that the words, "Hard, dry sandstone, having over 95 per cent. silica," be stricken from the report.

Mr. Churchill: A matter like this is far-reaching, and it is too far-reaching to adopt without considerable attention being paid to the question. I will grant that applies to sandstone in this State, and perhaps to parts of western Pennsylvania, but it does not apply by any means to all sandstone. The Committee has correctly stated the proposition when they make it depend on the silica contained therein. I have seen sandstone that comes close to conglomerate rock, than which there is nothing harder. It is as hard as any limestone you can get; and the three stones, the trap rock, the hard limestone, and the very glassy hard sandstone make first-class ballast. We have in use both the sandstone and the best limestone, and I have used the trap rock, and I know that there is no choice between the two, a good quality of limestone and a hard sandstone. I am not talking about yellow sandstone, freestones, or anything of that kind at all. I mean the real hard sandstone that will cut, and produce a glassy surface.

Mr. Cushing: It does not make any difference how hard sandstone is. It is the way it wears. It wears round, which is one of the troubles with sandstone bal-

*Report of the Committee of the American Railway Engineering & Maintenance of Way Association, March, 1902.

last. Limestone wears and chips off and leaves a sharp edge, or does more so than a sandstone ballast. While sandstone may be exceedingly hard in itself, it is the way that it breaks and the edges wear off that spoils it for ballast.

Mr. McGuigan: I agree with Mr. Churchill that the committee is correct in placing sandstone amongst the other varieties of stone for ballast. I also agree with my friend from the Pennsylvania road that it is not the best stone, but there are sections of the country where there is no other stone available, except different varieties of sandstone; and I can see no advantage in saying that it is not fit for ballast. The form in which sandstone breaks as a rule makes it somewhat objectionable; it does not break in square cubes as the harder stones do, but is inclined to chip off and does not work as nicely, and does not hold the track in line so well. It does, however, make a fairly good ballast, and certain roads are almost compelled to use it, as they have no other stone available, and for that reason I believe the committee is justified in including sandstone.

Mr. Hunter McDonald (N. C. & St. L.): I move that on the second page there be added at the end of the first paragraph the words, "Gravel containing a considerable amount of sand should be screened."

Mr. H. C. Phillips: Is there any mention whether the gravel is water washed gravel, round gravel, or angular gravel?

Mr. Hunter McDonald: It is not a question of sand and gravel at all; but I think the point the gentleman makes is well taken. I should have included water washed or round gravel. I find when it has a large mixture of sand it will not hold the track. Others have a screen sand that will hold, although the sand is in it. I made the motion, in order to get an expression from the house as to that question.

Mr. D. W. Lum (Southern Railway): It seems to me, "Water washed gravel" would mean the sand more than the angular gravel. Water washed gravel cannot help but be composed largely of round stones, and it would be impossible to keep it under the ties.

Mr. Samuel Rockwell (L. S. & M. S.): I have a few dozen gravel pits on the Lake Shore road, and I have taken samples from all of them and separated the sand in one pile and the gravel in the other pile, and there is just about 50 per cent. sand. We hold our track pretty well with that kind of gravel, and prefer gravel that is loose. We would as soon have rather loose sand, but we manage to hold the track all right with that gravel.

Mr. Cushing: The use of screened gravel so far has been very successful indeed. It has been noticed in wet weather that a track put up in screened gravel keeps its surface better than the track that is put up with gravel with a large admixture of sand amounting to about 50 per cent. at least. The gravel varies so much in its size that the very small particles of the gravel are sufficient to cause the rest of the gravel to pack pretty well together. The small particles and the large pieces mingle well together and hold up very well.

Mr. Lum: Is that angular gravel or round gravel?

Mr. Cushing: It is round gravel, the usual gravel from river runs, not crushed at all. The cohesion is due to the fact that there are a large number of small particles of gravel, which might be considered as exceedingly coarse sand, mixed in with it, to bind it together. If they were all of a uniform size, I do not believe they would answer very well.

Mr. McDonald: The idea I have always had in regard to the trouble with gravel is that the sand, when it is first put in with the gravel, will not go to the bottom. It remains all through the voids, but as soon as the rains come on it, the sand washes to the bottom and makes the whole roadbed settle. Of course, if the gravel is of uniform size, it would not do it so much as with the fine sand, which runs to the bottom. A sharp sand would not, possibly, be so bad, but my experience is that the fine round sand should be screened out of the gravel if you want to maintain a roadbed.

Mr. McGuigan: I think if you condemn any gravel with more than 30 per cent. of sand, you will not only condemn the gravel used on the Lake Shore, but the gravel used on nearly all the other railroads. Our experience with water washed gravel is that it holds the track better with the sand in it than if the sand is taken out.

Mr. Churchill: Mr. Cushing said that although he screened his gravel still there was sand in it. Can we not get at the bottom of this matter by asking the size of the sand left in the gravel? I think it is possibly the seat of the trouble—the coarseness of the sand.

Mr. Cushing: The way our gravel is obtained is this: There is a sand company which screens this gravel for the purpose of obtaining the sand for commercial purposes. That is, all the sand which is taken out of it, such fine sand for commercial purposes as is sold for building operations and various kinds of industries, glass plants, etc. The remainder is taken by the railroad company and used exclusively for the ballasting of the branch line on which the company is located which screened the sand, and there has been a noticeable increase in the quality of the track on that branch since we have used the screened gravel ballast. In connection with the water washed gravel there is a piece of road which the B. & O. has, near Newark, which is ballasted with what may be considered water washed gravel, which is dug directly from the bed of the creek or river, and they have been enabled to maintain an excellent track on that piece of road. I have been familiar with it for a long time. It therefore seems to me we are really getting into hair splitting again, when it comes to the discussion of this sand question. It is a difficult matter for us to say just how much sand is injurious to the ballast. I feel that a large proportion of sand is injurious to ballast. I believe from what I have seen that an excellent track can be kept up on washed gravel at economical cost, and a most excellent track can be maintained on screen gravel, screened in the way in which I have mentioned.

The Ice Gorge on the New York Central.

At the time of the severe floods on Feb. 28 and the first few days in March, there was an unparalleled gorge of ice in the Hudson River near Coxsackie which caused an overflow on to the tracks of the Hudson Division of the New York Central & Hudson River R. R., as described in our issue of March 14, page 195. We show herewith two illustrations which will serve to give an idea of the general appearance of the tracks at this point after the ice had been partially cleared away. The fall of temperature which followed the floods had the effect of uniting the loose ice, which had drifted on the tracks, in such a manner that the workmen had to practically make a cut through solid ice, which varied from 4 ft. to 12 ft. in depth. For a distance of three-quarters of a mile or more, it was necessary to rebuild the roadbed.

Views on the Line of the New York Central & Hudson River Railroad Near Coxsackie, N. Y., After the Flood of February 28.

Test of Bismarck, Washburn & Great Falls Lignite-Burning Locomotive, No. 3.

In the *Railroad Gazette* of January 10 we gave a description and illustrations of a Baldwin compound consolidation locomotive with trailing wheels, built especially for lignite-burning on the Bismarck, Washburn & Great Falls Railway. From that description we recall for the convenience of the reader, the cylinder dimensions, 14 and 24 x 26 in., driving wheel diameters 50 in., total heating surface 2,496 sq. ft., grate area 56 sq. ft., and the total weight in working order 166,900 lbs., 128,000 lbs. of which is on the drivers. The working steam pressure is 200 lbs. per sq. in.

The preliminary road test of this locomotive was made late in December, soon after its delivery, on the Bismarck, Washburn & Great Falls, where the maximum grade is one per cent. and the curvature 9 deg. The weather was calm and the temperature of atmosphere 30 deg., and there was snow level with the top of the rail. The adhesion was good and it was unnecessary to use sand except where snow covered the rail. There was no difficulty in maintaining the steam pressure between 190 and 200 lbs. per sq. in., and with 940 tons of train made up of 14 loads at the front and 17 empties at the rear, the maximum speed on level track was 18 miles an hour and the lowest speed when crossing the summit of the one per cent. grade, on a 9 deg. curve, was two miles an hour. This locomotive was built to haul 890 tons over the track described, with atmospheric temperature at 55 deg. It is estimated, therefore, that with some snow on the rails and the temperature at 30 deg., as in this first test, the locomotive exceeded its rating by 200 tons.

When the locomotive was sent out from the works, the front end was fitted with wire netting 3½ x 3½ mesh, No. 12 wire gage, but this has since been changed to 4 x 4 mesh No. 13 steel wire, giving a mesh of about ⅛ in. With the latter equipment there are no perceptible live sparks from the stack when the locomotive is working at full valve travel and with the furnace door closed. When the furnace door is open, as in firing, there are some light floating sparks trailing from the stack, of much the same nature as the very fine sparks which sometimes appear above the stack of an anthracite-burning locomotive. These sparks are extremely light and small and carry no such menace of fire as the ordinary soft coal spark.

After the locomotive had been put through these preliminary trials it was taken to the Northern Pacific and tested on the division between Mandan and Jamestown, where all the tonnage and mileage desirable could be had. We have received from Mr. E. H. Walker, Traffic Manager and Auditor of the Bismarck, Washburn & Great Falls, records of two trips made on the Northern Pacific which show very satisfactory operation, and the data are given herewith. The steam pressure and water level of the boiler were noted every five minutes while the locomotive was working. The reverse lever quadrant is blank the space of 3½ notches from the center to the first notch in forward gear, and from that point forward there are 10 notches, spaced one notch per inch. The distance from Mandan to Jamestown is 107 miles, and the average opposing grade was estimated at .4 of one per cent. The engineer and fireman were strange to the Northern Pacific track, the weather was clear and the rail dry, the atmospheric temperature being about 32 deg. F. The coal was Washburn lignite, and the test was conducted by Mr. E. H. Walker, and Mr. C. H. Burrows, Master Mechanic, of the B., W. & G. F., and Superintendent C. J. Wilson and others of the Northern Pacific.

The records from Jamestown to Mandan, 1,564 tons of train, average over the division, with 50,500 lbs. of coal used, and on the preceding trip, Mandan to Jamestown, 1,288 tons of train with 36,000 lbs. of coal used, emphasize Mr. E. H. Walker's comment sent us, saying "the matter of economy is one which is rather hard to estimate, as it is evident that without a mechanical stoker one man cannot throw the amount of fuel consumed in the average run as a day's work. The test proved conclusively that as a lignite-burning locomotive the machine turned out by Baldwins is a success, and that lignite coal can be made to maintain steam in a locomotive boiler under heavy usage."

The records of the two trips referred to follow:

Trip East, Feb. 19, Mandan to Jamestown.

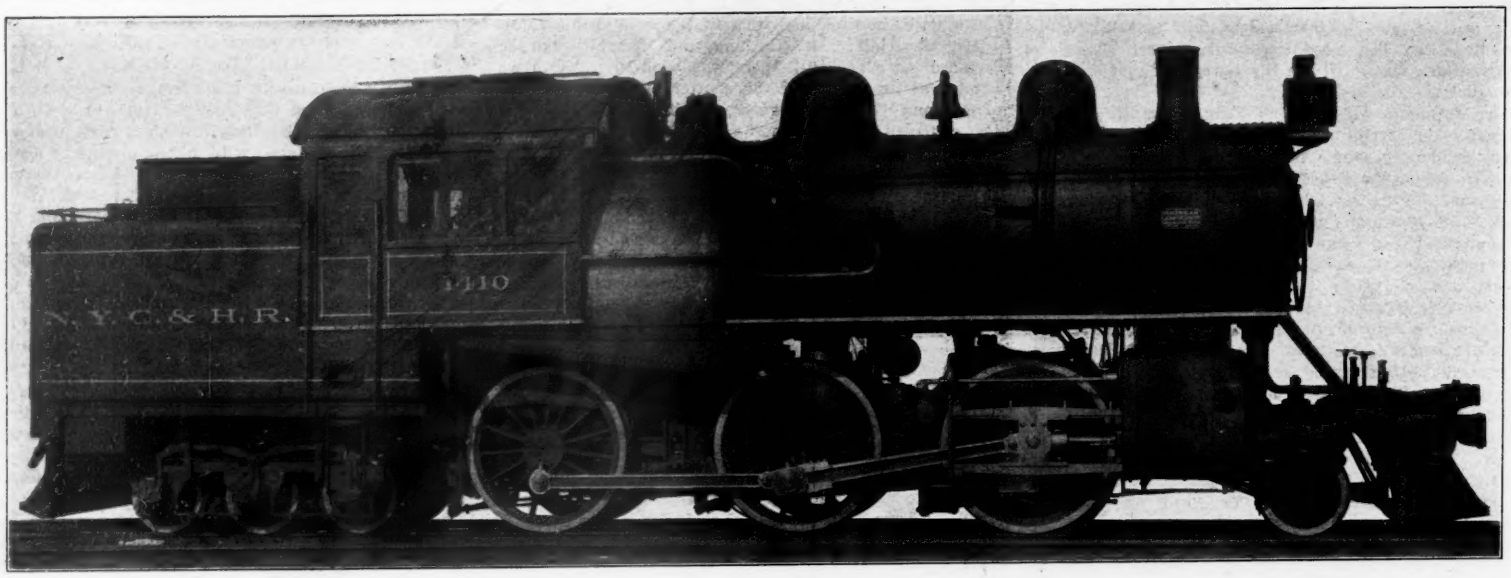
Average train, tons	1,288
Number of cars in train	42 loads
Total amount coal consumed	36,000*
Average steam pressure maintained	195.15 lbs.
Maximum	200 lbs.
Minimum	160 lbs.
Average water level in boilers as shown by gage cocks,	2.88 gages
Maximum	3 gages
Minimum	½ gage
Average cut-off as shown by reverse lever quadrant,	2.5 notches
Maximum	9 notches
Minimum	1 notch
Pounds of water evaporated per pound of coal	2.4 lbs.
Running time, including delays	11 hrs. 30 min.
Running time, not including delays	5 hrs. 57 min.

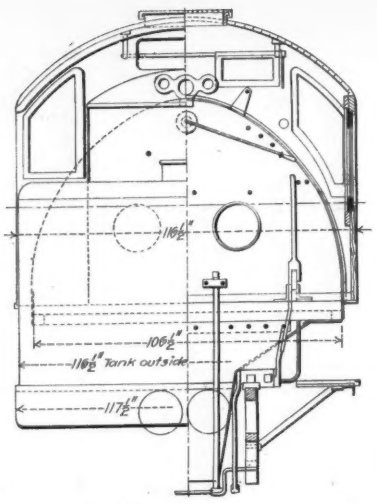
Trip West, Feb. 20, Jamestown to Mandan.

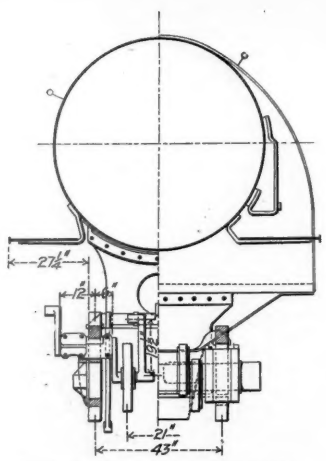
Average train, tons	1,564
Number of cars in train	40 loads and 5 empty
Amount of coal consumed	50,500 lbs.†
Average steam pressure maintained	188.28 lbs.
Maximum	200 lbs.
Minimum	140 lbs.
Average water level	2.53 gages
Maximum	3 gages
Minimum	½ gage
Average cut-off	4.53 notches
Maximum	10 notches
Minimum	1 notch
Pounds of water evaporated per pound of coal	2.1 lbs.
Running time, including delays	15 hrs. 42 min.
Running time, not including delays	8 hrs. 2 min.

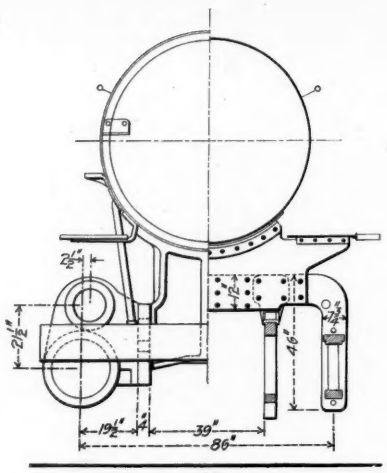
*This includes amount used in firing up and running engine six miles to deliver at Mandan; estimated quantity for this performance, 3 tons.

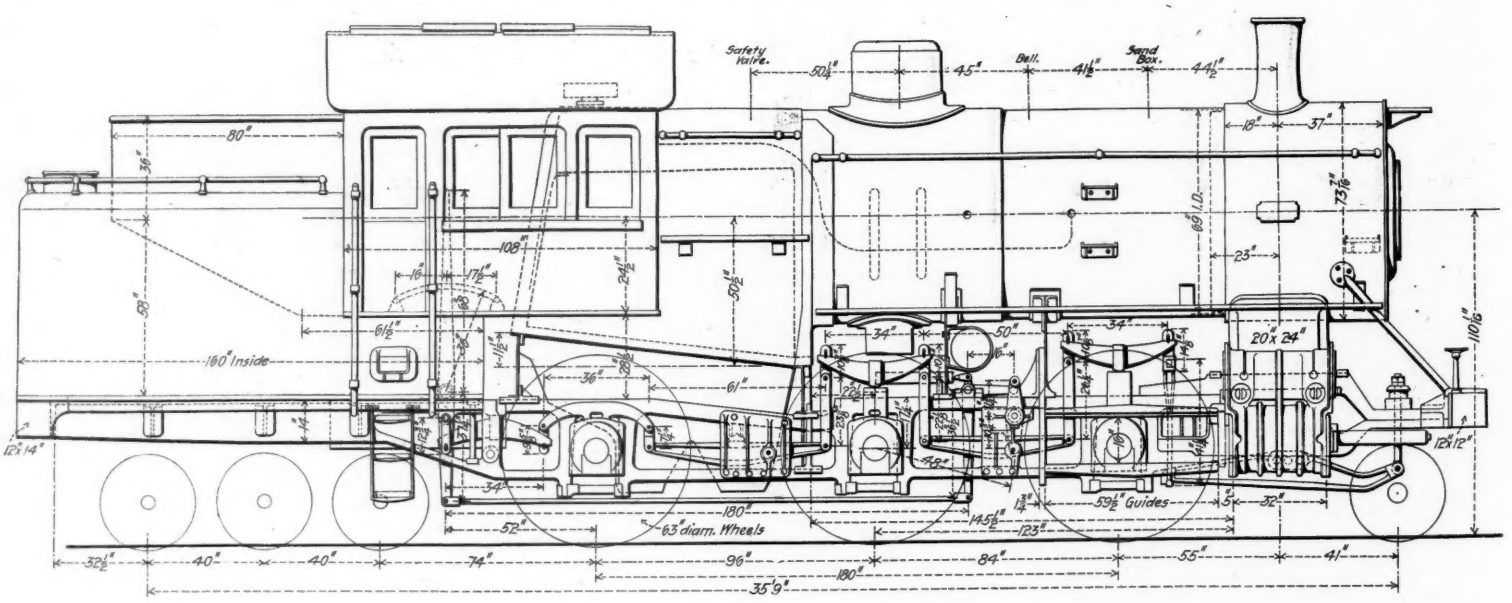
†This includes amount used in firing up engine at Jamestown and in yard, which is estimated at 2½ tons.

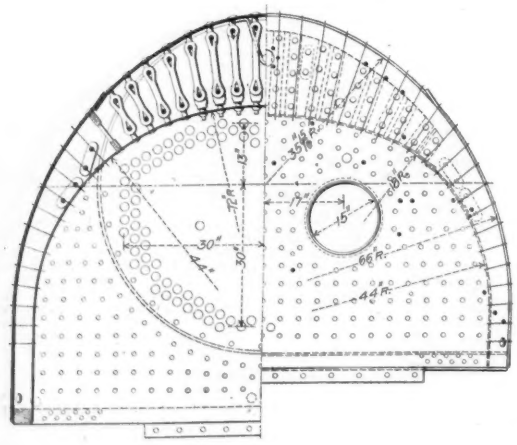


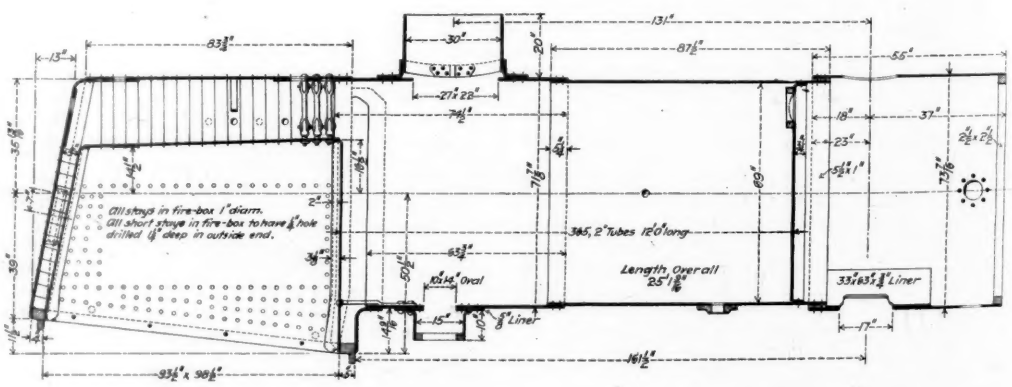












Built at the SCHENECTADY WORKS OF THE AMERICAN LOCOMOTIVE COMPANY.

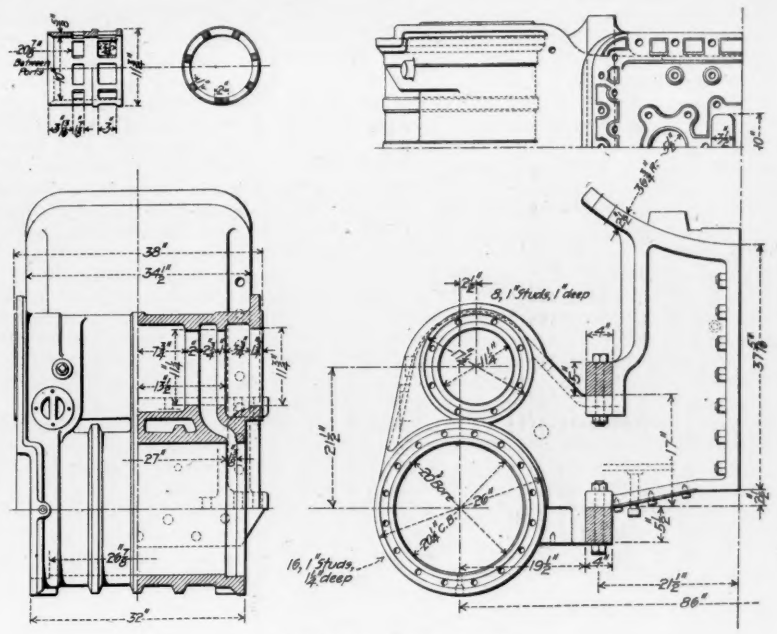
Heavy Suburban Locomotive—New York Central.

MR. A. M. WAITT,
Superintendent of Rolling Stock and Machinery.

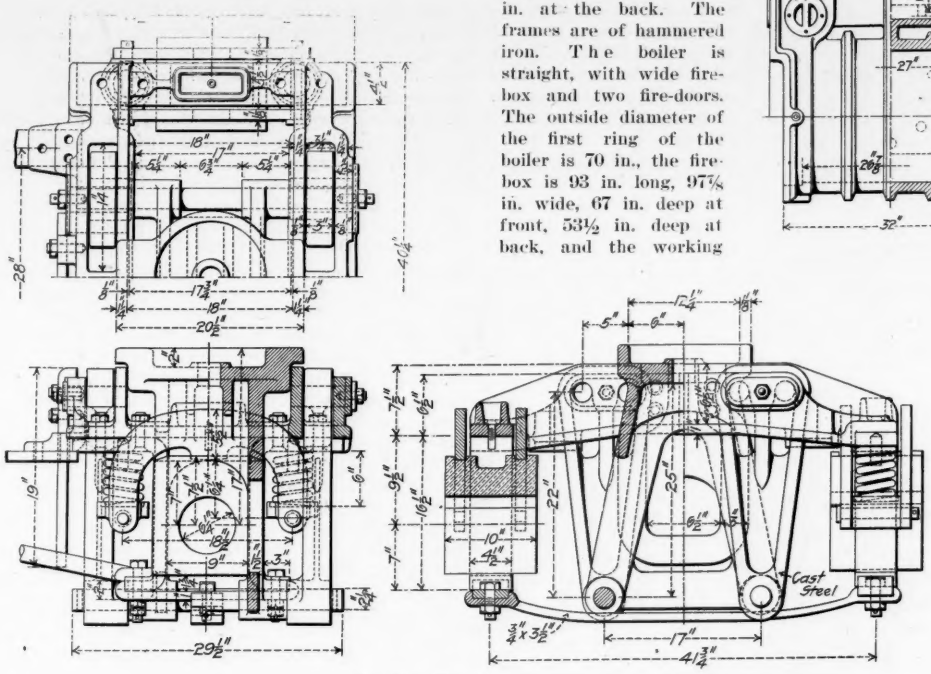
Heavy Double-End Suburban Locomotive for the New York Central.

The accompanying illustrations show the heavy double-end suburban locomotive of the New York Central, 16 of which have been ordered and 6 of which have been in service on the Harlem and the Hudson Divisions for several weeks. The first locomotive of this class was sent out from the Schenectady works of the American Locomotive Company some months ago, and its work was so satisfactory that a subsequent order for 15 locomotives was soon placed without any material changes being made in the design except that the tender capacity was somewhat increased.

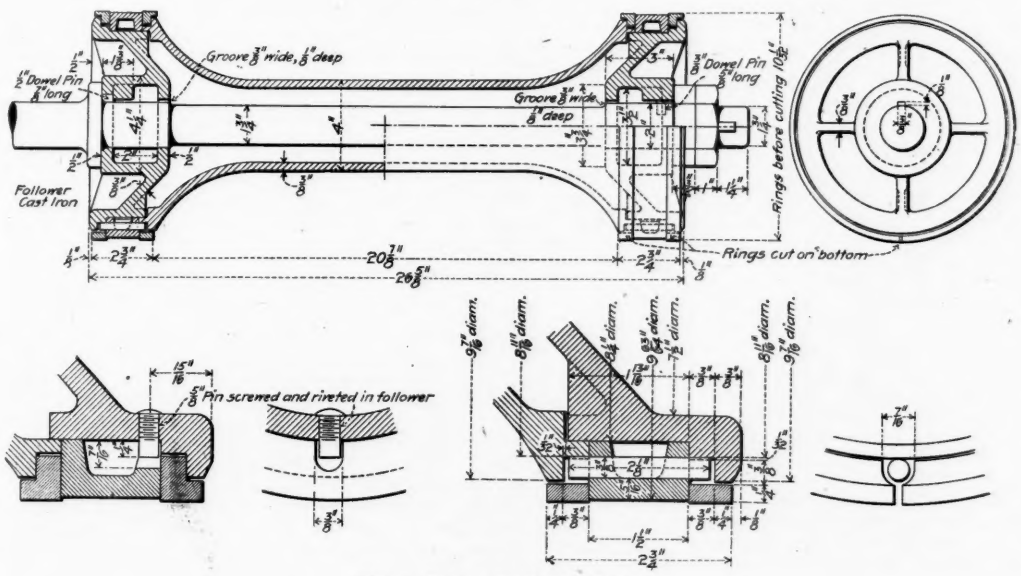
These locomotives have simple cylinders, 20 x 24 in., and piston valves with inside admission, 5½ in. travel in full gear, ⅞ in. steam lap, line and line on the exhaust edges, and set line and line in full gear forward, which gives about ¼ in. lead at 6 in. cut-off. The driving wheels are 63 in. outside diameter, and the centers are cast-steel. The engine frames, which are narrowed down to plate form back of the junction of the upper and lower rails, extend under and support the tank. The dimensions of the frames where they are widened into plates are 2½ x 14 in., and the depth is narrowed to 12 in. at the back. The frames are of hammered iron. The boiler is straight, with wide fire-box and two fire-doors. The outside diameter of the first ring of the boiler is 70 in., the fire-box is 93 in. long, 97⅞ in. wide, 67 in. deep at front, 53½ in. deep at back, and the working steam pressure is 200 lbs. per sq. in. The crown sheet is stayed with 1⅛ in. radial stays, and there are 365 tubes 2 in. o. s. diam. 12 ft. long over tube sheets. The heating surface in tubes is 2,275 sq. ft. and the fire-box has 162 sq. ft., making the total 2,437 sq. ft. for a grate area of 62.07 sq. ft., the fuel being anthracite coal.



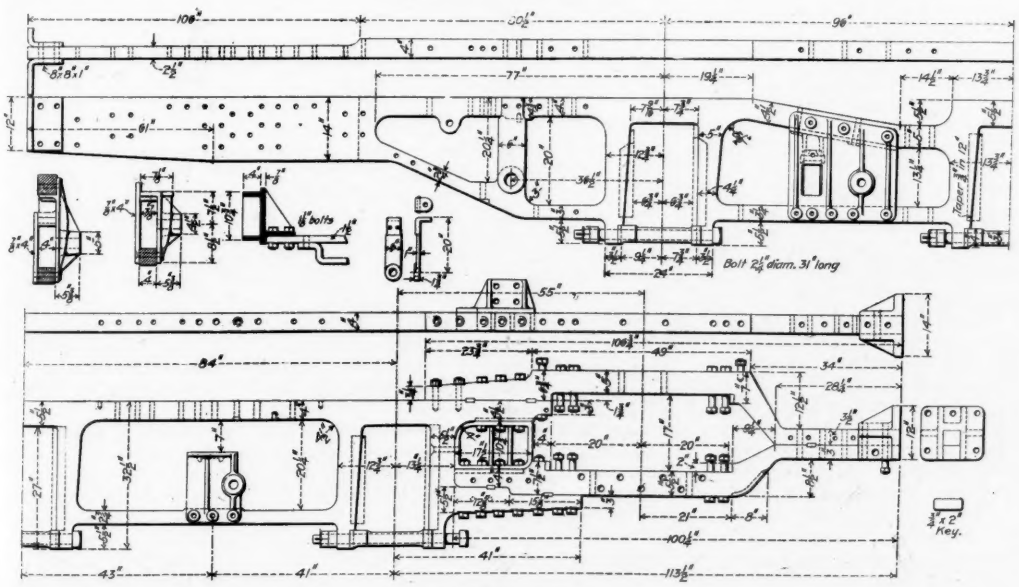
Cylinder and Half Saddle.



Leading Truck.



Piston Valve—Inside Admission.



Engine Frames—Iron.

The weight in working order is 216,000 lbs., 128,000 lbs. of which is on the driving wheels. This we believe is the heaviest suburban locomotive in use. The driving wheel base is 15 ft. and the total wheel base of the engine is 35 ft. 9 in. The leading truck is an adaptation of the three point suspension two-wheeled truck, and the rear truck under the tank is six-wheel, center-bearing, swing motion, with wrought iron side bars and iron cross-beams. The capacity of the tender is 3,700 gallons of water and 5 tons of coal.

The general construction, the boiler, cylinders, frames and important details of this locomotive are shown, with a photograph of engine No. 1,410. Other information in detail is given in the descriptive specifications.

General Dimenstons.

Gage	4 ft. 8½ in.
Fuel	Anthracite coal
Weight in working order	216,000 lbs.
Weight on drivers	128,000 lbs.
Wheel base, driving	15 ft. 0 in.
Wheel base, rigid	15 ft. 0 in.

Cylinders.

Diam. of cylinders	20 in.
Stroke of piston	24 in.
Horizontal thickness of piston	5 and 4½ in.
Diam. of piston rod	3½ in.
Kind of piston packing	Cast iron
Kind of piston rod packing	United States

Valves.

Kind of slide valves	Piston type
Greatest travel of slide valves	5½ in.
Steam lap of slide valves	⅞ in.
Exhaust lap of slide valves	0 in.
Lead of valves in full gear	Line and line full stroke forward; ¼ in. lead at 6-in. cut-off
Kind of valve stem packing	United States

Wheels, Etc.

Diam. of driving wheels outside of tire	63 in.
Material of driving wheel centers	Cast steel
Tire held by	Shrinkage and retaining rings
Driving box material	Cast steel
Diam. and length of driving journals	9 in. dia. x 12 in.
Diam. and length of main crank pin journals, Main, 6 x 6½ in.; main side, 7 in. dia. x 5 in.	
Diam. and length of side rod crank pin journals, Front, 5 x 3⅝ in.; back, 5 in. dia. x 3⅜ in.	
Engine truck, kind	2-Wheel swing bolster
Engine truck, journals	6¼ in. dia. x 10 in.
Diam. of engine truck wheels	30 in.
Kind of engine truck wheels	Krupp No. 3 cast iron spoke center with 3⅛ in. tire

Boiler.

Style	Straight, with wide fire-box
Outside diam. of first ring	70 in.
Working pressure	200 lbs.
Material of barrel and outside of fire-box	Coatesville steel
Thickness of plates in barrel and outside of fire-box, ½ in., 23/32 in., 5/8 in., ¾ in.	
Horizontal seams	Butt joint sextuple riveted, with welt strip inside and outside
Circumferential seams	Double riveted
Fire-box, length	93 in.
Fire-box, width	97⅞ in.
Fire-box, depth	F., 67 in.; B., 53½ in.
Fire-box, material	Carbon steel
Fire-box plates, thickness	Sides, 5/16 in.; back, ⅜ in.; crown, ⅜ in.; tube sheet, ½ in.
Fire-box, water space	Front, 5 in.; sides, 4 in.; back, 4 in. and 5 in.
Fire-box, crown staying	Radial, 1⅛ in. diam.
Fire-box, stay bolts	Taylor iron 1 in. diam.
Tubes, material	Charcoal iron
Tubes, number of	365
Tubes, diameter	2 in.
Tubes, length over tube sheets	12 ft.
Heating surface, tubes	2,275 sq. ft.
Heating surface, fire-box	162 sq. ft.
Heating surface, total	2,437 sq. ft.
Grate surface	62.07 sq. ft.
Grate, style	Rocking, cast iron grate
Ash pan, style	Hopper, dampers front and back
Exhaust pipes	Single
Exhaust nozzles	5 in., 5¼ in., 5½ in. dia.
Smokestack, inside diameter	14 in.
Smokestack, top above rail	14 ft. 8 in.
Boiler supplied by	2 Monitor injectors screw-handled R. and L. inside of cab

Tank and Back End of Engine.

Wheels, number of	6
Wheels, diameter	30 in.
Journals, diameter and length	5 in. dia. x 9 in.
Rear truck	6-Wheel center bearing, swing motion, with wrought iron side bars and iron cross beams
Water capacity	3,700 U. S. gals.
Coal capacity	5 tons
Total wheel base of engine and tender	35 ft. 9 in.

The engine has the following special equipment: Three

consolidated muffled safety valves; Westinghouse-American combined brakes; 9½ in. air pump and Westinghouse air signal; Leach D-2 double sand feed; Gould couplers; Star 6 in. chime whistle, and Sansom bell ringer.

The English and the Metric System.

A bill is now before Congress which will make the use of the metric system of measurement compulsory in this country., The Society of Mechanical Engineers is issuing an appeal to its members, to exert their influence individually with representatives in Congress to prevent the passage of this bill. The bill is advocated on two grounds: First, that the metric is the only scientific system, and second, that it is generally adopted, and uniformity in this respect is of the first importance.

The English system, employing several units, commensurable with each other, adapted to different uses, and each divided by continual bisection, while making no pretension in that way, is in reality in the highest sense scientific or philosophical; and this by reason of a feature which is wanting in the metric system, and the want of which renders that system unphilosophical, unnatural and inconvenient for the purpose of mechanical measurement.

We employ four units of linear measurement; the mile, the yard, the foot and the inch. Each one of these units has its individuality and a distinctive name. The same is true of the parts obtained by continual bisection. Each of these also has its individuality and distinctive name.

The problem always is, how can the idea of any distance or dimension be formed in the mind, and conveyed to other minds, with the greatest distinctness. The answer is obvious. We must employ the largest available unit of measurement, and supplement this, as required, by smaller units; employing the largest available division formed by continual bisection. When the reality cannot be expressed in this way, then, and not till then, must we resort to the decimal system of division, the value of which, in this limited field, is beyond all estimation.

This mode of expression brings the distance or dimension before the mind with a definiteness which cannot even be approximated in any other way. This advantage is possessed by the English system of measurement, and is retained by it to the utmost useful limit. Thus, we do not say 17,600 yards, but 10 miles; we do not say 120 inches, but 10 feet. And so universally. By employing the largest suitable unit, we see the distance or the dimension as a vivid reality. We are enabled also to apprehend more clearly the relation to one another of the different members of any construction. We reach correct proportions more readily, are less liable to errors either of design or figuring, and are more likely to detect errors if these are fallen into.

This system is in accord with the divisions of the circle, and of time, which are universally employed. In the former we have three units; the degree, the minute and the second. In the latter we have centuries, years, months, weeks, days, hours, minutes and seconds. Each one of these units also has its individuality and its distinctive name. Here, too, we always employ the largest of these units that is applicable, and by this means, as is obvious to everyone, the angle, or the interval of time is properly expressed to us. Any other mode of expression would be ridiculous. The decimal system is not resorted to, until we need it, to express divisions of the second, either the second of arc or the second of time.

This principle of employing the largest available unit is recognized by the French in adopting the kilometer (1,000 meters) as the unit for land measurement, and the meter as the unit for civil engineering work. Indeed, the French civil engineers have rather an advantage over our own, the meter being a larger unit than the yard.

But for the uses of the mechanical engineer all is reversed. Here the metric system bids defiance to this principle, and in place of the largest it substitutes the smallest unit, the millimeter (0.001 of the meter) nearly 0.04 in., and all mechanical measurements are expressed in terms of this unit. Where we would write 10 in., the metric expression would be 254 mm., approximately, as the two measurements cannot be expressed exactly each in terms of the other; 4 ft. 8½ in. is an illustration of our system of employing the largest unit, supplemented as already described. The definiteness of each item will be observed. The metric equivalent is 1434 mm.

This system, in its application to mechanical measurements, presents a dreary monotony of abstract figures, while the draftsman is in a state of constant anxiety lest he misplace the decimal point.

All this results from the fundamental error of employing the decimal system in a field to which it is not adapted. It should be observed that, while our own decimal system is in decimals of an inch, we employ it in micrometer measurements only; sometimes, however, for convenience writing in decimals the fractions obtained by continual bisection.

It will be seen that the philosophical superiority of the English system lies in the fact, that figures express realities of distance or dimension with a definiteness that in the metric system cannot be approached. This is the secret of its greater convenience for mechanical measurements.

But everything we are told, must be sacrificed to uniformity. I do not know why uniformity is of so much more consequence to us than it is to other people, that for it we must sacrifice what is priceless. Let other nations come to us. They have everything to gain by doing so.

There is also another view. English-speaking people have established the gage system, about which other nations know nothing except what we have taught them. We have been at immense pains to obtain the ideal inch, with its divisions on the natural system of continual bisection, and its multiples, and their combinations, with the utmost exactness, as concrete realities. These are in universal use with us. All our mechanical construction is adapted to them. The universal screw thread system, another Anglo-Saxon gift to the world, is founded upon them. All this also we are to be compelled to throw away. This would involve a loss and confusion, beyond all power to estimate.

This, however, is nothing, compared to the abandonment of the philosophical principle, on which our system of mechanical construction rests. How little do our legislators imagine what it is they are meddling with!

Is there not power enough in the English-speaking people to defend for their own mechanical engineers the invaluable principle of employing the largest unit of measurement, and moreover to make its application as universal for constructive work, as it is for everything else—for the civil engineer, for geographical measurement, for the circle and for time? CHARLES T. PORTER.

Some of the Work of the Government in Cross-Tie Preservation.

At the recent meeting of the American Railway Engineering and Maintenance of Way Association, Dr. Hermann von Schrenk (Division of Forestry and Shaw School of Botany), made an address explaining some of the important work now on hand looking toward increasing the life of ties. His remarks follow nearly in full:

Gentlemen, perhaps I can tell you in a brief way what we have been trying to pound away at during the past year and perhaps outline to you what we propose to do in the future. At the instance of your Association last year you may remember I outlined in a few words what we had thought might be the function of the national government with respect to this question of the timber supply of the country. I am glad to see that your committee on ties has made so urgent a point of the fact that it is a subject which all the railroads will have to look into in a very short time, and at the suggestion of the tie committee we started last year to formulate a general scheme involving not only the railroads but practically all of the large interests in the country using timber to any extent, with the point in view of trying to determine ultimately something of a timber census of the United States for the use of such as were using timber on a large scale. I doubt not that all of you would be very glad if we could tell you to-morrow how much timber was along your lines and how much you had to draw upon, but we realize that that is an immense subject which we don't propose to tackle until we get ready for it, in other words, until we have the means at hand and trained men at hand. But it is a subject which turns in other directions besides getting the mere fact of how many thousands of feet of timber we can count along our roads. It turns in the direction of trying to increase the length of life of the ties, and thereby cutting less timber along our tracks; also in the direction of using inferior grades perhaps, which we haven't used up to the present time. That is the tendency of certain industries along the lines of roads which cannot get along without timber, and at the same time it involves the use of cheap material, which might serve the purpose for which we use high grade materials at the present time.

We started in with a threefold plan. First of all to determine the possibility of using inferior grades of material for railroad tie purposes. In the second place, we started in to make a practical test such as I outlined to you, of which a brief report is made in this report of the tie committee, to find out what the relative value of these various treating processes was. And following out the suggestion which I made last year, we laid some 10 kinds of timber in a location in southern Texas, on the Southern Pacific road, a full report of which will be sent to all of you within a week. I regret that the slowness of the government printing office did not enable me to get this report in time for this meeting. That track was finished about three weeks ago and it was labeled carefully so anybody can tell what the state of repairs is, and we hope that timber which rots ordinarily in eight to 12 months in that section will give you some comparative records.

We propose in the future to increase that on a very much larger scale. In other words we are going to ask the co-operation of every railroad in the country in the matter of treatment of ties of one kind or another, the different processes, so that comparative records in different regions, under different geological conditions, can be obtained under scientific and accurate instruction. It seemed to us very important to determine, as we did, in relation to the preserving processes, the relations between the materials and the different factors surrounding the life of a tie in the roadbed, and with that end in view I spent about seven months in Europe last summer with railroad commissioners of our government, and with the commissioners of the various countries we visited, and went over the experimental tracks for various treatments.

I cannot pass this subject without expressing my appreciation to the railroad men in this country for the uniform courtesy and more than courtesy extended to me in their name and in the name of their government, by the high officials in charge of practically every one of the governments of England, Germany, France, Russia. They not only gave me special cars and trains, but pulled out the ties and switched trains aside so that we might have an opportunity of getting the information we desired. They opened their books to me and all their records, from which I was able to get such facts and statistics as might be desirable, and I regret I can't publish all of that. A great many of them are in the nature of private information, but those are in the records of our department, and anyone who cares to look over this may do so, and I shall be glad to show it. Some of these have been published in this report I speak of which you will all get.

So much for what has been the plan of our operation. Now as to what we propose to do in the future. The first thing I would like to emphasize, and I can't emphasize too strongly, the suggestion made by Mr. McDonald as to the keeping of records on the various railroads. Those of you who have gone over the tie records of the various roads in this country, as I have during the last year, have probably been disgusted with the impossibility of drawing any conclusions whatever as to the use of certain kinds of timbers; great columns of figures as to how many ties came out of the track are absolutely worthless from the standpoint of determining the value or life record of a great many kinds of timbers. Notwithstanding there are a great many published accounts, the only ones that are trustworthy are the ones of the Southern Pacific Company, because they know how many ties went into the track and know how many came out of the track. Stamping ends of the ties with a stamp has been found practically useless, and in spite of published accounts which engineers have given you, I will dispute always the reliability of such records, because if you have 500 ties and every 25 out of 500 has an illegible mark at the end, it vitiates the whole result, and it is impossible to do anything with it. We shall do everything we can to persuade the railroad managers of the country to start marking the ties in some indelible way, and begin to-morrow. It would be a very good thing if we had these records for half a dozen different sections of the United States to-day, and the time is here now and it cannot be done any too soon for these records to be kept and kept accurately. It will be no use for one road to keep a record for one month or two months, and I am sure if you will study this table which your tie committee has brought out, you will be impressed with the great gaps in them. I sent out last year blanks to about twelve roads to determine what their reliability was, and I visited the purchasing agents and the auditors' offices to find out absolutely what these figures were based upon, and you will probably be surprised to hear that a good many of them were worth absolutely nothing. In other words, the men who had charge of those things will have to take a great deal more trouble than they have hitherto. And the objection made by a great many in authority that section men and roadmasters won't fill out those blanks, I don't think will hold water one minute, provided it is desirable that they should be filled out. The filling out of those records and sending in to a central authority who will tabulate them is the only way by which we will be able to tell anything in respect to the tie situation of this country. Therefore I want to urge with sufficient force this matter of getting accurate records and tabulating them.

One other point I wish to emphasize is this. We have come to the time now when the good old slovenly way of dealing with timber, not only among the railroad people, but those who use material, has evidently got to pass away, and we have got to adopt means and methods for getting longer service out of our material and better service. The secret of success of the European roads, as I saw it this summer, and as I was told by most of the engineers in charge, could be summed up in one word. They realize that a treated tie, if it is worth treating, is worth taking care of after it is treated. That implies, of course, that the treatment is only half of the business. Treating a tie is a chemical process which one has got to understand and it is not as easy as one might suppose. In Europe the treating work is in charge of trained chemists; accurate inspection is made of every carload of material for treatment before and after. In other words they regard the tie as something worth handling and taking care of throughout the whole process, from beginning to end, and that is one of the reasons why they get such great lengths of life.

Aside from the timber proposition, one of the chief things which is going to enter into the matter is to get longer use out of the tie, not only by treatment but by seasoning, and we are going to start within a month or so by taking two or three thousand ties in various sections of the country, and a number of the roads have been more than willing to assist us in this matter by furnishing us ties for temporary use. Our men are going to weigh those ties for weeks at a time so as to determine positively the most practical way of seasoning those ties, so as to get longer life out of them. You can get two or three years more use out of green ties by impregnation, by a practical system of piling, so as to get the water out of the tie, in the most practical way, and we have discovered a method by which it can be done at the slightest possible cost.

The use of timbers which will have to be grown is a matter we will have to start with at some future time, and we have already made plans for laying 15 or 20 miles of track in various sections of the country, and I want to ask the co-operation of all within hearing to-day in making tests of this character. We will furnish ties and we will guarantee their shipment, and we want them laid in such a way that nobody will interfere with keeping the

record of the material in co-operation with the particular road doing it.

The subject of tie plates, ballasting and incidental matters connected with the use of the particular tie are matters that will probably receive attention. All of these subjects are set forth in the bulletin which I spoke of, and you will all receive that during the next few weeks, and I want to ask you to look over that point with a view of active criticism. The matter was compiled and the point of view was suggested on various lines of action, and I believe you will find that with a centralized authority looking over a wide field, wider than any one particular road can deal with, it will be found of advantage to you to co-operate to the fullest extent.

Chilled Cast Iron Car Wheels.*

Chilled cast-iron car wheels are distinctly an American product. In America they are used under all freight cars and many passenger cars. According to the statistics giving the number of cars in service during the year 1901 there are in round numbers 12,000,000 cast-iron car wheels in use under freight and passenger cars. In addition to this, cast-iron wheels are used almost exclusively under cars running on street and inter-urban railroads. The total tonnage of cast-iron in use in the shape of car wheels now in service approximates 3,500,000 tons, or about one-quarter of the total output of pig iron in the United States in the past year.

The first cast-iron wheel of which I can find any record was made in the year 1800, and was used under small tram cars in Wales. These wheels were without flanges and were very similar in pattern to the ordinary wagon wheel. They ran on rails shaped like angle irons, the flanges being on the outside of the rails. They were made out of ordinary gray iron without any chill. It was not until nearly 50 years after this that they began making wheels with chilled treads and flanges. Among the first to make wheels of this character were Bush & Lobdell, of Wilmington, Del., and Whitney & Sons, of Philadelphia.

Great improvements have been made in the manufacture of cast iron car wheels since the middle of the last century. The greatest improvements, however, have been made within the last 15 years. The life of a cast-iron car wheel measured in mileage has been doubled in the past 15 years, that is to say, the wheels which are turned out now are guaranteed for six years, while those turned out 15 or 20 years ago were guaranteed for not more than three years. In the same way in the mileage we guarantee wheels to-day for 75,000 miles, while 40,000 miles was considered a high mileage guarantee 15 years ago.

The severity of the tests required to-day by railroads for cast-iron car wheels could not have been met 15 years ago. At that time five blows was usually specified for the drop test, and there was no such thing as a thermal test. Fifteen years ago the wheelmakers were almost without exception making their mixtures without the aid of chemistry, while to-day chemistry is one of the important factors in the manufacture of car wheels. In addition to this, much has been done in the last ten years in the way of scientific research, and also by taking advantage of physical tests to an extent which would hardly be credited by those not familiar with what is going on. As a result, the quality of the cast-iron wheel has been greatly improved within the last few years, and this was necessary, for the reason that the service required of car wheels at the present day is much more severe than it used to be, owing to the very great increase in the carrying capacity of cars.

The increase in capacity as between the 24,000 lbs. capacity cars on the one hand and the 100,000 lbs. capacity cars on the other hand amounts to 333⅓ per cent. The increase in the area of the axles at the wheel seat as compared between the axles used under 24,000 lbs. capacity cars and 100,000 lbs. capacity cars amounts to 175 per cent. The guarantee of wheels as between that given 15 years ago and that given to-day has increased 100 per cent., while the increase in the weight of wheels used has amounted to about 25 per cent.

The number of wheels per car being the same under a 50-ton car as under a 12-ton car, and the increase in load being 333⅓ per cent., and the increase in guarantee being 100 per cent., there is a demand for increased efficiency in cast-iron car wheels of 433⅓ per cent. If the added tare weight of the 50 ton car over the 12 ton car is considered, it can be reasonably estimated that there is a demand for a 500 per cent. increase in the service of car wheels to-day over the service demand which existed not over 15 or 20 years ago. It is only natural for anyone to ask why the weights of the wheels have not been increased in proportion to the weights of the other equipment, such as rails and axles. One answer which I can make to this question is that the cast-iron wheel has been giving such satisfactory service under the old style of equipment that it was thought that it was sufficiently strong to carry over twice, and sometimes three times the load which it has been carrying. This, however, has been found to be wrong, and the tendency of the times is towards a heavier wheel for heavy capacity cars, and it looks very much as though a 700 lb., 33 in. wheel would be considered standard for cars of from 80,000 lbs. to 100,000 lbs. carrying capacity.

Another reason why the railroads have been slow in sanctioning any material increase in the weight of standard car wheels is due to the fact that they do not see their way clear for an increase in the thickness of the flange of the wheel. This is due to the fact that the clearance left between the inside of the track rails and the guard rails, and also the clearance between the points of the frogs and the wing rails of the frogs are of such standard dimensions that any material increase in the thickness of the flange would not permit it to pass through between the guard rail and the track rail, and for this reason we do not see our way clear for any material thickening of the flange until the railroads change their standards for frogs and other special work in their tracks.

The requirements which a car wheel must be taken in service to-day are such that every care must be taken to turn out the very best product. When it is borne in mind that the car wheel is the only part of the equipment of the railroad which is itself in motion, except the axle, and when we bear in mind that it is the wheel that transmits the load from the axle to the rail, and when we consider that the wheels at the same time that they are carrying the load are a good deal of the time in motion, sometimes making 500 revolutions a minute, while running over tracks which are not always in the best condition, and while striking frogs, crossings and switches, we get a fair idea of what is required of a car wheel. However, the car wheel has not only to carry the load at a high rate of speed, but it also furnishes the agency through the brakes for stopping the train.

Few people realize the severity of the work required in stopping a train of heavily loaded cars when running at a speed of 40 miles an hour by means of the friction of the brakes on the wheels. This work generates an enormous amount of heat, which is absorbed by the wheels and results in their expansion. This expansion strain is so great as sometimes to cause a breakage of the wheel; consequently, the manufacturer must provide a sufficient factor of safety so that the wheels will stand this expansion strain without causing breakage. There is probably no other part of vehicles used in transportation that goes through the wear and tear required of a car wheel. They frequently carry a load approximating 15 tons per pair of wheels, and this load is a good deal of the time in rapid motion, and while the wheels are in rapid motion carrying this load the brakes are applied and the wheels heated at times to such an extent that the oil from the journal boxes will ignite on the surface of the wheel, and while in this condition they are sometimes required to pass through snowbanks, resulting in a sudden cooling contraction, which is a very severe test of the tensile strength of the wheel. It will be seen that the car wheel must have a maximum amount of strength with a minimum amount of weight, and this has been the hard nut for the wheelmaker to crack. How well we have succeeded is borne out by the fact that the consumption of cast-iron wheels is continually on the increase, and at the same time the quality of the wheel is being improved from year to year.

*A few extracts from an address delivered before the Engineering students of Purdue University by Mr. C. H. Vanuler, of the Griffin Wheel Company, Chicago.

Train Accidents in the United States in February.‡

NOTE.—*An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.*

rc, 1st, Pittsburgh & Western, Glenshaw, Pa., a freight train which had stopped to take on coal was run into at the rear by a following freight, and the engine and several cars were wrecked. A brakeman was killed.

dn, 1st, Pittsburgh, Cincinnati, Chicago & St. Louis, Piqua, Ohio, a freight train was derailed at the derailing switch, approaching the crossing of the C. H. & D., and the engine was overturned. Nine cars were ditched. The engineman and fireman were injured.

xc, 2nd, 6 a.m., New York Central & Hudson River, East Rochester, N. Y., a westbound passenger train collided with a freight train, wrecking a baggage car. One engineman was injured. There was a dense fog at the time.

†rc, 3rd, 4 a.m., Illinois Central, Apple River, Ill., a freight train ran into the rear of a preceding freight, wrecking two cabooses and five cars of cattle. Four drovers in the foremost caboose were killed and three others were injured. The foremost train was taking water.

bc, 3rd, Seaboard Air Line, Limerick, Ga., butting collision between a passenger and a freight, damaging the engine and several cars. A mail clerk was fatally injured; both enginemen and both firemen were also hurt.

xc, 3rd, 11 p.m., Southern Railway, Atlanta, Ga., collision of freight trains, damaging both engines and wrecking six cars. Three trainmen were injured, one of them fatally.

xc, 4th, Illinois Central, Alworth, Ill., collision between a passenger train and a freight; one fireman killed, two other trainmen injured.

rc, 5th, Fort Worth & Denver City, Days, Tex., an empty engine ran into the rear of a preceding freight, wrecking six cars. The conductor of the freight was killed.

bc, 5th, 3 a.m., St. Louis Southwestern, Pritchett, Tex., butting collision between a passenger train and a freight. Several persons were injured.

*rc, 6th, 2 a.m., Pennsylvania road, Dravosburg, Pa., rear collision of freight trains, damaging the caboose and five cars. The wreck took fire and was burnt up.

‡Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The tabular statement of totals will be omitted entirely, as a more complete report of the total number of accidents is to be published by the Interstate Commerce Commission. The separation of the classes is abandoned, but the classification will be indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defect of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

unf, 6th, St. Louis & San Francisco, Olathe, Kan., a freight train broke through a bridge which had been weakened by fire, and 15 cars fell to the stream below.

rc, 7th, 5 a.m., Southern Pacific, Gibson, La., a freight train standing at the station was run into at the rear by a following freight, and the engine and several cars were wrecked. One engineman was killed and several trainmen were injured.

xc, 7th, Granger, Ind., a passenger train of the Grand Trunk collided with a passenger train of the Cleveland, Cincinnati, Chicago & St. Louis at the crossing of the two roads, knocking the Grand Trunk engine off the track and wrecking the station building. It is said that a snowplow had passed through on the C., C. C. & St. L. a short time before and had broken down the gate at the crossing which should have warned one or the other of the colliding trains to stop. One engineman and one conductor were injured.

unf, 8th, 11 p. m., Northern Pacific, Lake, Wash., a freight train was derailed by running into a landslide and the engine and several cars were wrecked. A part of the wreck fell into Lake Washington. The fireman was burnt to death.

rc, 9th, Pittsburgh & Lake Erie, Boston, Pa., a freight train ran into the rear of a preceding freight, wrecking the caboose and two cars. Two brakemen were injured.

xc, 9th, Cincinnati, New Orleans & Texas Pacific, Danville, Ky., collision of freight trains, badly damaging both engines. One fireman was fatally injured.

dn, 9th, West Virginia Central & Pittsburgh, Hambleton, W. Va., a freight train became uncontrollable on a descending grade and 12 cars were derailed and wrecked. Two trainmen were injured.

*†rc, 10th, 5 a.m., Pittsburgh, Fort Wayne & Chicago, Haysville, Pa., a freight train ran into the rear of a preceding freight which had been unexpectedly stopped, wrecking the caboose and several cars of cattle. The wreck blocked all four main tracks. It took fire and two cars of cattle were burnt up. A drover in the caboose was burnt to death, and another drover and one trainman were injured. It is said that the engineman of the second train had fallen asleep.

rc, 10th, Central Vermont, Dwights, Mass., a northbound freight train, taking water, was run into by a following freight, damaging the engine and several cars. A man stealing a ride was killed.

xc, 10th, Ann Arbor road, Clare, Mich., a freight train broke in two on a descending grade and the rear portion afterward ran into the forward one, making a bad wreck. Three trainmen were injured.

*rc, 11th, Seaboard Air Line, Forestville, N. C., a freight train entering a side track was run into at the rear by a following freight, wrecking the caboose, two freight cars and an empty passenger car. The wreck took fire from the stove in the caboose and was mostly burnt up. A brakeman was killed and his body was burnt, and another brakeman was fatally injured.

bc, 11th, Philadelphia & Reading, Coatesville, Pa., butting collision between a passenger train and a freight, badly damaging both engines. One passenger and one engineman were injured.

dn, 11th, Savannah, Florida & Western, Du Pont, Ga., passenger train No. 35 was derailed at a misplaced switch, and the engineman and fireman were injured.

unx, 11th, Georgia Railroad, Sharon, Ga., a freight car in a mixed train was derailed and, with several other cars, including one passenger car, fell down a bank. The passenger car fell into a creek. Ten passengers and four trainmen were injured.

*rc, 12th, 9 p.m., New York Central & Hudson River, La Salle, N. Y., a passenger train ran into the rear of a preceding freight, damaging the engine and the caboose. The caboose took fire and was burnt up.

xc, 12th, 9 p. m., Pennsylvania road, Waverly, N. J., collision between a passenger train and a freight engine, damaging both engines. The engineman of the passenger train was scalded to death and the fireman was injured. A trainman, who ran to a hotel for a stimulant, was shot by the proprietor of the hotel who, having been lately attacked by burglars, took the trainman for a robber.

12th, Erie road, Phalanx, Ohio, passenger train No. 10, running at full speed, was derailed, supposedly by a loose rail, and all of the cars were ditched; 20 passengers were injured.

unx, 12th, Savannah, Florida & Western, Albany, Ga., a passenger train was derailed and the first two cars were wrecked and thrown down a bank. The engineman and a mail clerk were injured.

rc, 13th, Cincinnati & Northern, Battle Creek, Mich., a freight train taking water was run into at the rear by a following freight, badly damaging the caboose. Three passengers in the caboose were injured.

rc, 13th, Manhattan Elevated, Third Avenue line, 103rd Street, New York City, a passenger train standing at the station was run into at the rear by a following passenger train, badly damaging the platform of one car. Six passengers were injured.

rc, 13th, Baltimore & Ohio, Indiana Harbor, Ind., rear collision of freight trains; two trainmen killed; two injured.

*bc, 13th, Duluth & Iron Range, Duluth, Minn., butting collision of freight trains, in one of which the caboose was at the front. The caboose was wrecked and, with two cars, was destroyed by fire. A brakeman was killed.

dr, 13th, 4 a.m., Pennsylvania Lines, Helena, Ohio, passenger train No. 405 was derailed by a broken rail, and the mail car was overturned. Two mail clerks and one trainman were injured.

dn, 13th, Illinois Central, Jackson, Miss., passenger train No. 3 was derailed at a switch, which is said to have been out of order, and all of the cars were ditched.

o, 13th, Choctaw, Oklahoma & Gulf, near Little Rock, Ark., a work train was wrecked by a large rock which fell from a bank just as the train passed, and seven employees were killed; 13 were injured.

rc, 14th, 5 a.m., Pennsylvania road, Allegrippus, Pa., an eastbound freight train of two engines and 30 cars which had become uncontrollable on a steep grade, ran into the rear of a preceding freight, standing near the signal cabin. The two engines, the caboose, and 26 loaded cars were damaged. One of the engines fell down a very high bank. Three trainmen were killed, and five were injured. Part of the wreck fell against a westbound freight and the engine and several cars of that train were wrecked.

eq, 14th, Chicago, Rock Island & Pacific, Brighton, Iowa, a freight train broke in two while on a trestle bridge, and the resulting shock derailed 14 cars, which fell 18 ft. to the ground below.

unf, 14th, Southern Railway, Clifton, S. C., passenger train No. 13 was derailed by a rock which had fallen on the track, and the engine was wrecked. Four cars were overturned. The engineman and fireman were injured.

*bc, 15th, night, Pittsburgh & Lake Erie, Round Bottom, Pa., butting collision of freight trains, wrecking 20 cars. The wreck took fire and was partly burnt up.

One engineman and one fireman were killed. There was a dense fog at the time.

bc, 15th, 11 p.m., Iowa Central, Eldora, Iowa, butting collision between a passenger train and an empty engine, making a bad wreck. Both enginemen and both firemen were killed, and several passengers were injured.

rc, 15th, 9 p.m., Delaware, Lackawanna & Western, Scranton, Pa., a freight train, consisting of an engine and 58 heavily loaded cars, became uncontrollable on a descending grade and collided with a caboose and two engines in Scranton yard, wrecking the caboose and badly damaging three engines. A brakeman was injured.

rc, 16th, Cincinnati, New Orleans & Texas Pacific, Crittenden, Ky., a local freight train which had just started from the station was run into at the rear by a following fast train drawn by two engines, and the caboose and both engines were wrecked; 12 cars were derailed. A brakeman was killed and three other trainmen were injured.

rc, 16th, Illinois Central, Litchfield, Ill., a passenger train, which was moving at reduced speed on account of some difficulty with the engine, was run into at the rear by a following freight train, badly damaging the engine and the rear passenger car. The fireman and one brakeman on the freight were killed, and three passengers and two trainmen were injured. There was a dense fog at the time.

bc, 16th, Illinois Central, Texas Junction, Ill., butting collision between a passenger train and a freight. Two trainmen and one passenger were injured.

xc, 16th, New York Central & Hudson River, Rochester, N. Y., an eastbound passenger train ran into a freight which was crossing the main track, and both engines and three freight cars were wrecked. Two trainmen were injured.

dn, 16th, Lake Shore & Michigan Southern, Bryan, Ohio, eastbound passenger train No. 16 was derailed at the derailing switch approaching the crossing of the Cincinnati Northern. The engineman and fireman jumped off and were injured.

rc, 17th, Illinois Central, Gates, Tenn., rear collision of freight trains, wrecking one locomotive and several cars. Three trainmen were injured.

17th, Lake Shore & Michigan Southern, Vermillion, Ohio, a freight train broke through the bridge over the Vermillion River, and 20 cars fell into the stream.

unx, 17th, Yazoo & Mississippi Valley, Clinton, La., a mixed train was derailed and the passenger car was overturned. A brakeman was killed and six passengers were injured.

eq, 18th, Southern Railway, Iron City, Ala., a freight train was derailed by a broken axle and ten cars were ditched. A tramp was killed.

*rc, 19th, Baltimore & Ohio, Frankville, Md., an empty engine, which had been stopped on a steep grade, was run into at the rear by a following freight train and pushed with great violence into the rear of another freight train standing ahead of it. The caboose of the standing train took fire and was burnt up.

dr, 19th, Columbus, Sandusky & Hocking, Columbus, Ohio, a freight train was derailed by a broken rail and two engines and 32 cars were ditched. The boiler of one of the engines exploded. One engineman was killed and four other trainmen were injured.

o, 19th, East Tennessee & Western North Carolina, Elizabethtown, Tenn., the engine and several cars of a freight train were wrecked by an explosion of dynamite which was on the track and was struck by the engine. One employee was killed and six were injured, two of them fatally.

unf, 20th, Delaware, Lackawanna & Western, Little York, N. Y., a snowplow, propelled by two locomotives, was derailed in a drift. One employee was killed and six were injured.

eq, 21st, Lake Shore & Michigan Southern, Oberlin, Ohio, a passenger train was derailed by the failure of a crank pin and the consequent wrecking of one side of the engine. Several cars were ditched. One passenger and one trainman were injured.

eq, 21st, Grand Rapids & Indiana, Fort Wayne, Ind., a passenger train was derailed by the breaking of something in a truck of the baggage car. The persons on the train all escaped with very slight injuries.

21st, Texas & Pacific, Greenwood, La., a freight train was derailed on a trestle bridge and 16 loaded cars fell through the bridge.

rc, 22nd, 3 a.m., New York Central & Hudson River, Syracuse, N. Y., a freight train ran into the rear of a preceding freight train, damaging the engine and seven cars. The wreck took fire and was mostly burnt up. The engineman was killed and the conductor was injured.

bc, 22nd, Chicago & North Western, Summit Lake, Wis., butting collision of freight train, making a bad wreck. One engineman and one brakeman were killed and two other trainmen were injured. It is said that the collision was due to a misunderstanding of orders.

unx, 22nd, Seaboard Air Line, Scott, N. C., a freight train broke through the bridge over Roanoke River and five cars of oil fell into the stream. One trainman was injured.

xc, 23rd, Wabash road, Logansport, Ind., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking eight cars loaded with flour, one of which fell into the Wabash River.

unx, 23rd, Chicago & Grand Trunk, Evergreen Park, Ill., a wrecking train was derailed and the engine and two cars were ditched. One employee was killed and two were injured. The wreck took fire but the flames were soon extinguished.

rc, 24th, Philadelphia & Reading, Conshohocken, Pa., a passenger train was run into at the rear by a following passenger train and nine passengers were injured. There was a dense fog at the time and the automatic signals were not working on account of the wires having been broken in a sleet storm.

bc, 24th, Philadelphia & Reading, Bridgeport, Pa., collision of freight trains in the yard; one conductor was killed and another trainman was fatally injured. There was a dense fog at the time.

bc, 24th, 11 p.m., New York Central & Hudson River, Aurelius, N. Y., butting collision between westbound passenger train No. 211 and an eastbound wrecking train, both running at good speed. Four trainmen and one man on the wrecking car were killed and two other employees were injured, one of them fatally. The wrecking train was wrongfully running on the time of the passenger train. The negligent engineman was killed; the conductor said after the collision that his watch was 20 minutes slow.

bc, 25th, Texas & Pacific, Thurber Junction, Tex., butting collision between a passenger train and a freight, wrecking both engines and several cars. One fireman was injured.

rc, 26th, New York, Philadelphia & Norfolk, Bird's Nest, Va., a special passenger train ran into the rear of a preceding freight and the engine, caboose and one freight car were damaged. The caboose took fire and was burnt up. Two trainmen were injured.

bc, 26th, 8 p.m., Baltimore & Ohio, Girard, Ohio, butting collision of freight trains, wrecking both engines and four cars. Two trainmen were killed and five were injured, two of them fatally. It is said that the operator at the last station east had entered the eastbound train on the register, but put in no time; and that Conductor Allen, of the westbound, looked at the book and finding the train marked up but no time given, assumed that it had passed. The Pennsylvania tracks at this point parallel the B. & O., and each engineer thought the glare of the headlight in front of him was that of a Pennsylvania train.

eq, 26th, 1 a.m., New York, Chicago & St. Louis, Painesville, Ohio, a freight train was derailed by a drawbar, which was pulled out and fell on the tracks. Five cars fell off the high iron trestle bridge over Grand River and in their fall destroyed a number of braces of the bridge.

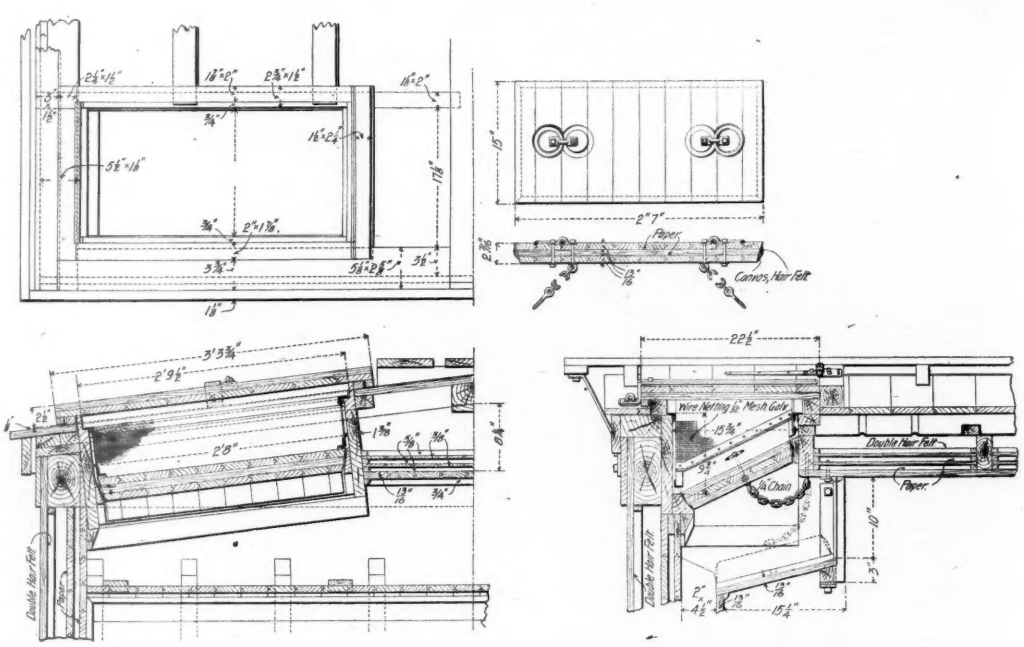
xc, 27th, Norfolk & Western, Pulaski, Va., collision between a freight train and an empty engine; one brakeman killed.

xc, 27th, Wheeling & Lake Erie, Massillon, Ohio, butt-

(Continued on page 232.)

A 60,000 Lbs. Capacity Produce Car—New York Central.

The accompanying illustrations show the design of a 35 ft. produce car of 60,000 lbs. capacity, 300 of which are being built at the Merchants Despatch Transportation Co.'s Rochester shops (New York Central) to meet special requirements on the New York Central in hauling fruit and vegetables. The car was designed by Mr. A. M. Waitt, Superintendent of Motive Power and Rolling Stock, to whom we are indebted for the drawings and information. It is interesting in showing how readily a standard 60,000 lbs. capacity box car can be adapted to this special service, as well as from the fact that it is an entirely new departure on the New York Central and, as far as we know, is the first of its kind to be used. There will be no refrigeration and the system of ventilation shown is generally similar to that used by the Pennsylvania Railroad.



End Ventilators—New York Central Produce Car.

The length over end sills is 35 ft., the clear length inside 32 ft. 10 in., the width over side sills 8 ft. 10 in., the clear width inside 8 ft., and the width over eaves 9 ft. 7½ in. The height from the top of rail to the top of eaves is 11 ft. 7¼ in., and from the top of rail to the top of running board 12 ft. 4⅝ in. The height from top of rail to the bottom of sills, at center, is 3 ft. 4½ in., and from the top of rail to the top of floor, at center, is 4 ft. 2¼ in. The height from top of floor to the bottom of carlines is 7 ft. 1½ in., and from the top of floor to the under side of ceiling, the clear height, is 7 ft. $^{11}/_{16}$ in. The clear height of door opening is 5 ft. 10½ in., and the clear width of door opening is 5 ft. It is intended that the light weight of the car shall approximate 34,000 lbs.

The trucks are Fox pressed steel for 60,000 lbs. capacity, with 5 ft. 2 in. wheel base. The journal boxes are McCord pattern for 4¼ x 8 in. journals, with malleable iron lid, and the dust guards are Harrison. The journal bearings are of the Magnus Metal Co.'s make, conforming to New York Central standard specifications. The wheels are of cast-iron 33 in. in diameter, weigh 600 lbs. each, and are pressed on the axle at not less than 30 tons nor more than 40 tons pressure. The axles are made to New York Central standard specifications for 60,000 lbs. capacity.

The arrangement of side sills, center and intermediate floor timbers, end sills and cross-tie timbers is apparent from the illustrations and in general conforms to ordinary good practice. The body bolsters are of pressed steel located 5 ft. from the outside of the end sill to the center of the bolster, and the center plates are also of pressed steel of New York Central size and contour, secured to bolsters with four ⅞ in. rivets, all of this construction being shown in the illustrations. There are four body truss rods used with saddles 6 in. high. The truss rods pass under malleable iron bearings 8 in. deep, bolted to the crosstie timbers, and then pass over the body bolsters, resting on the saddles. The draft beams are of malleable iron, New York Central pattern, with end caps made by the Gould Coupler Co. They are spaced to give a pocket 12 in. wide for follower plates and are flush with the outside edge of the wood buffer blocks. There is a 7½ x 5 in. white oak timber beneath each center sill and fastened to it by two 1-in. bolts, one of which passes through a cast-iron key block cut between the floor and draft timber, and there is also one ⅞ in. bolster bolt. These oak timbers extend from the draft beam to the bolster. The further attachment of draft beams to crosstie timbers is along lines of regular construction. The draft gear will be of the tandem spring type, arranged to suit the Gould and New York Central draft gear arrangements.

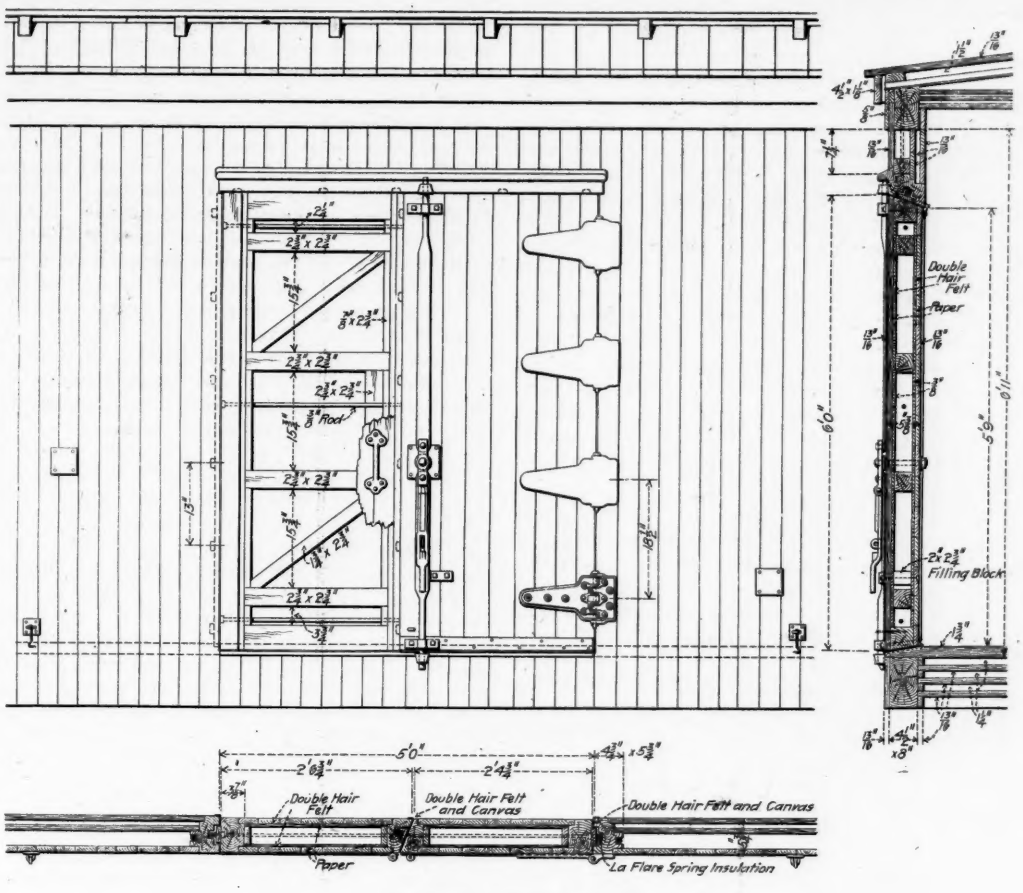
The ventilation is the most essential feature of the car, and as shown by the illustrations, the admission of air is through screens and ducts at the ends of the car. The mouths of the air ducts are controlled by removable drop doors, which fit with beveled edges into the openings provided, and which, when removed, are turned and dropped down through the rectangular openings and rest, as shown by the dotted lines. This gives a complete circulation of air through the car and its contents, whenever it is desired, and gives the means of protecting the contents of the car against extremes of outside temperature. In very cold weather it is intended that some artificial heat should be supplied inside of the car. The sides and ends of the car have two dead air spaces insulated with two courses of approved insulating paper and one course of double hair felt. There is one blind lining and an inside lining. The hair insulator is fitted between all posts and braces and against the outside sheathing, and is held in place by ¾ in. x ¼ in. cleats.

One course of insulating paper is placed against the inside faces of the framing and the paper is lapped 6 in. at the girth. The top and bottom edges of the paper are secured against the under side of the plate and to the floor, by 1 in. x 1 in. nailing strips. The blind lining and the girth, which is ⅞ x 6½ in., is placed over this course of paper and the blind lining extends from the floor to the ceiling all around. The lining is M. C. B. standard section $^{13}/_{16}$ in. thick, tongued and grooved. The second course of insulating paper is placed against furring strips $^{13}/_{16}$ in. x 3 in., located as shown in the illustrations, the space between the blind lining and the second course of paper being $^{13}/_{16}$ in. The lap in the second course is 6 in. wide and is made on a furring strip.

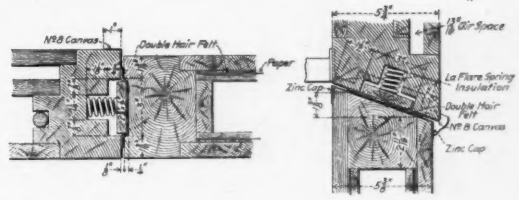
Between the sills there are three dead air spaces, each 1¼ in. deep, and there are two courses of $^{13}/_{16}$ in. lining cleated to the sides of the sills. The bottom course, which is $^{13}/_{16}$ in. thick, is held by 1 in. x 1¼ in. cleats. On top of the bottom course there is a double thickness of hair felt and on top of each of the other two $^{13}/_{16}$ in. courses, there is a course of insulating paper. On top of the sills there is another course of insulating paper between the sills and the floor.

There are two dead air spaces in the ceiling and the bottom course of the ceiling, that is, the course which is exposed inside of the car, is $^{13}/_{16}$ in. thick by 3¼ in. wide tongued and grooved material. There is one course of Grant P. & B. insulating paper, or its equivalent, between this course and the carlines. Above this course there is a ⅝ in. dead air space, ⅜ in. blind ceiling, ⅝ in. dead air space and ⅜ in. blind ceiling, ship-lapped with one thickness of paper on the top side of the lower course of the blind ceiling, and a double thickness of hair felt on the top of the top course of blind ceiling.

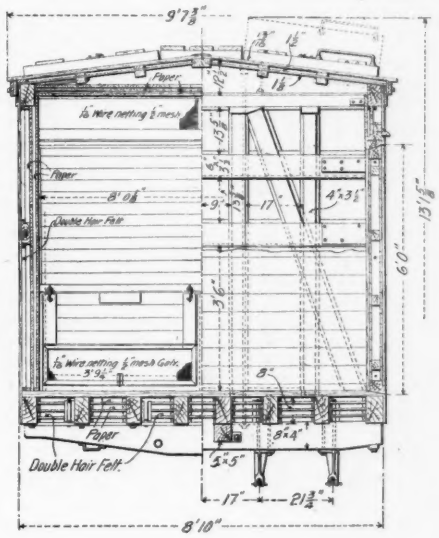
Aside from the special features to which we have referred, the construction conforms to the regular New York Central practice for box cars of 60,000 lbs. capacity.

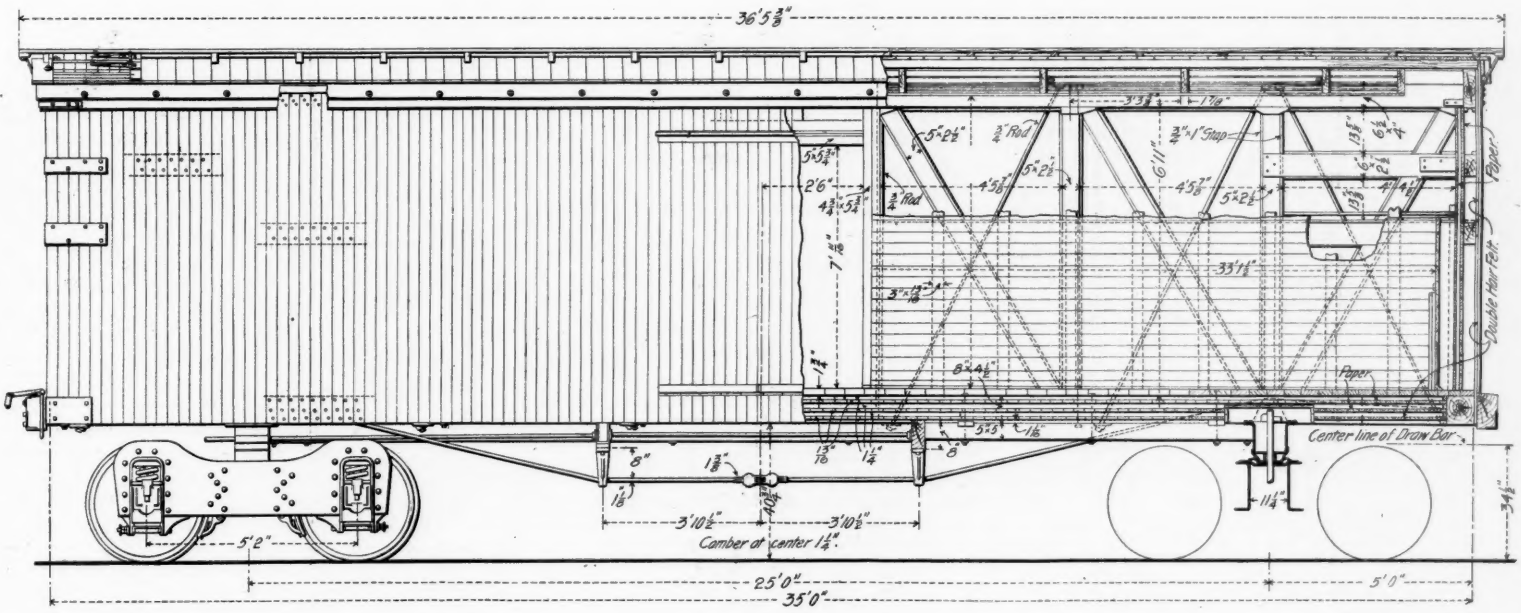


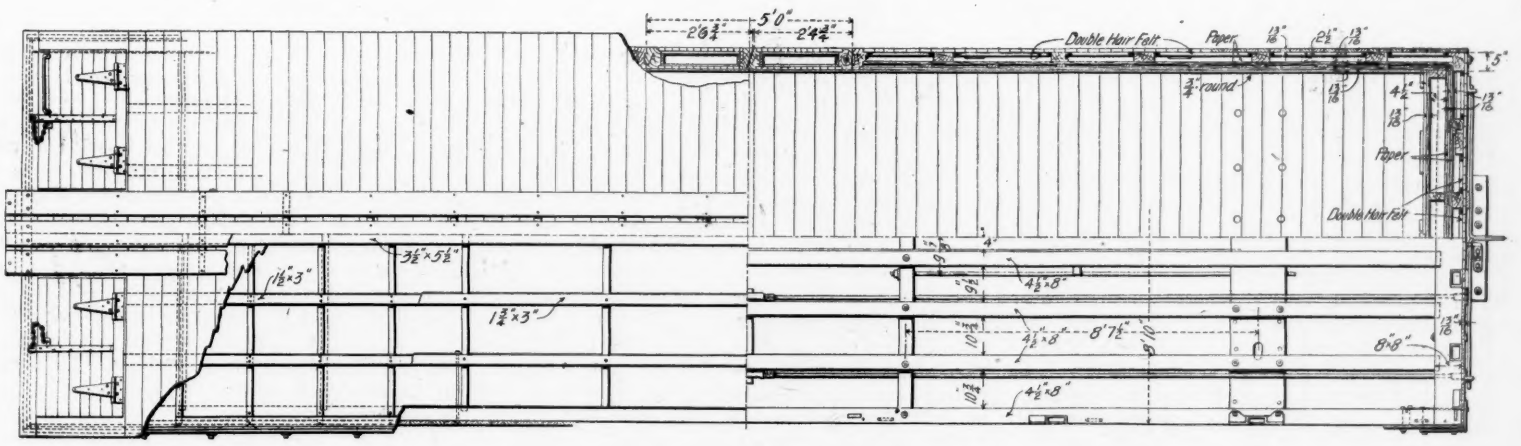
Doors and Sectional Views.



Door Insulation.







60,000 lbs. Capacity Produce Car—New York Central.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

For the International Railroad Congress at Budapest the Russian Ministry of Transportation has prepared a paper showing the development of railroads in European Russia (exclusive of Finland) in the last 20 years. The length of the railroad system in that time has increased from 14,091 to 27,487 miles, or 95 per cent. This is tremendous progress for Russia, and it takes no account of the great amount of work done in Asia meanwhile; but after all it is an average extension of only 663 miles yearly, and the whole extension of 13,393 miles in 20 years in a country of more than 100 million inhabitants is very little more than was completed in the single year 1887 in this country, when it had less than 58 million inhabitants. Passenger traffic in Russia was just about three times as great in 1900 as in 1880, and freight traffic four times as great. Gross earnings increased 168 per cent., working expenses 120½ per cent. and net earnings 290 per cent. The fact that traffic has increased 200 and 300 per cent., while working expenses have increased but 120 per cent., shows that there has been a very large decrease in the cost per unit of traffic, which is a natural consequence of the greater density of traffic (nearly 50 per cent. more passenger-miles and 100 per cent. more ton-miles per mile of road), not to speak of improvements in road, rolling-stock and methods.

But for the lamentable accident at the end of December on the Liverpool Overhead Railway, 1901 would have been a record year of safe railroad traveling throughout the United Kingdom, and no deaths of passengers would have been due to railroad accidents. As it is, we think the year's work may be claimed as a record, because the Liverpool Overhead is only a glorified tramway and has no goods traffic. All our railway methods have been made, regardless of expense, subservient to the attainment of safety, and apparently we have at last reached perfection; but between our ultra Board-of-Trade-safety methods, and the recklessness of American ones, there is surely some intermediate condition that would suit us just as well, and be much less costly than our own.—*Railway Engineer, London.*

So the statement that American railroad methods are reckless has come to be taken for granted. Well, without stopping to complain of that, what, let us ask, would be that intermediate condition which, without being too safe, would be just safe enough? It must be that our esteemed contemporary has in mind automatic block signals, which are much cheaper than non-automatic, and by which excellent records for safety have been made in America for a number of years. It should be noted, however, that these really constitute a Board-of-Trade-safety instrumentality, if we may judge by the small record of collisions due to failures of automatic signals; so that it cannot be said that a reduction in cost is necessarily accompanied by an "intermediate condition" as regards safety. The Board of Trade has, we understand, given its conditional approval of automatic signaling on the London & South Western, so it would seem that the way is tolerably clear for the English roads to go ahead with the desired reduction in the cost of keeping their train running safe. We observe, however, that the Government Inspector asks or requires the South Western to have an overlap for each block section, besides providing distant signals. This is an extreme precaution, the use of which, in connection with automatic signals, we have never heard of in America. Of course, our cousins must not expect to get all the American advantages of American signals, as regards cheapness of installation and celerity of movement, if they make "Board-of-Trade-safety" modifications in applying them. However, we are not disposed to be hypercritical, for we may wake up some morning to find Board-of-Trade-safety in America. In the Fourth Avenue tunnel, New York City (equipped with manual controlled signals), 800-ft. overlaps are being provided for block sections which already have distant signals; and two prominent signal engineers are speaking favorably of the English idea of protecting trains on crossings by holding off all trains on the transverse tracks by two home signals.

In most countries popular opinion concerning railroad rates is determined more by the charges for passengers than by those for freight; though with few exceptions low freights have a very much greater effect on the national prosperity. This popular feeling is reflected especially in a state railroad system, where it tends to force down fares, in some cases, with little doubt, unduly. In Belgium, where the population is very dense, and mostly very poor, the great coal and iron industries afford an exceptionally heavy freight traffic; and as a very large proportion of the production must find a foreign market, and thus meet the competition of all other countries, the cost of transportation must be in many cases of vital importance. Yet little is said about freight rates, while there is constant discussion of fares and frequent changes, almost all downward. The report of the State Railroads for 1899 shows the average earnings per passenger train-mile were but 69.1 cents, while the average expense per train-mile of all kinds (no separation between passenger and freight is made) was 66.8 cents. Meanwhile, the average earnings per freight train-mile were $1.73. The average passenger-train load was 78; the material for ascertaining the average freight-train load is not given in the figures now published; but in 1898 it was 143 tons. It seems hardly possible to avoid the conclusion that very nearly the whole of the passenger receipts are absorbed by the expenses; and that interest on the investment in the State Railroads is paid almost wholly by the freight traffic. In 1898 the average rates were 1.20 cents per ton-mile and in 1899 0.8 cent per passenger-mile, against 0.724 cent per ton-mile and 1.925 cents per passenger-mile in this country. Our traffic at the Belgian rates would have produced $164,000,000 less passenger earnings and $569,000,000 more freight earnings than the actual earnings; but on the other hand our rates applied to the Belgian traffic would have produced $17,500,000 more passenger earnings and $9,400,000 less freight earnings; so that in either country the other's rates would have increased the total railroad earnings. This is, of course, because in Belgium passenger traffic is proportionally greater than freight, while the reverse is true here. Here to every 100 ton-miles there were but 11½ passenger-miles; in Belgium no less than 75. In the latter country, 37 per cent. of all the passenger journeys were made on reduced-rate tickets good only for workmen. These journeys averaged only 10⅔ miles. These workmen's special rates, which long existed, have given to the Belgian railroads a large part of the travel which the street railroads carry here.

The restriction upon, and closer regulation of, the business of giving passes, is in general a good thing and is in exact line with the notions which have been held in the office of the *Railroad Gazette* for many years. It is already adding to the net revenues of the railroad companies. The president of one important railroad has told us within a month, that he is saving $1,000 a day through the better control of passes. But we are not at all confident that the restrictions restrict altogether in the right place. Cutting off exchange passes will diminish the travel of railroad officers in those grades where salaries are small, and those are just the officers who ought to travel. For instance, we have observed two or three times recently at meetings of railroad clubs and also at the convention of the American Railway Engineering and Maintenance of Way Association, diminished attendance because of the difficulties in getting transportation. Now another convention is at hand, where the effect will be still more serious, because most of those who would naturally attend it, get pretty small pay. The convention of the Air Brake Association, to be held in Pittsburgh, April 29, will probably be much reduced in attendance because of the inability of the members who are employed in different branches of air-brake work on the railroads to get transportation over other lines than their own to Pittsburgh. Only such air-brake men as are employed by the roads entering Pittsburgh will be able to attend the convention, except as others see fit to pay their own fare, or except as the railroad companies choose to pay for them. It will be unfortunate if a serious hindrance is put on the work of this energetic young organization which has done very much in the past ten years to lift air-brake practice out of a condition of indifference and neglect. The Air Brake Association has been a valuable and appreciated feeder to the railroad clubs and to the Master Car Builders' Association. It is in close co-operation with the latter organization, in the matter of maintenance of freight brakes, labor costs, repairs, etc.; and while a check to its activity might not disrupt the Association, it would surely do real harm to the railroads themselves. If the railroad companies cannot see a way to get passes for their representative air-brake men to the Pittsburgh convention they ought in the interest of the service to pay their fare. The attendance at the Master Car Builders' and Master Mechanics' conventions may not be considerably affected, as those who usually attend will prefer to pay rather than fall out of the procession; but the air-brake man will be obliged to miss his convention, as he cannot afford to pay railroad fare; and, we repeat, this would be unfortunate for the railroads.

The Committee Work of the Maintenance of Way Association.

Those who attended the last convention of the Maintenance of Way Association must have heard more or less serious complaints of the quality of the committee work. There were those who complained that the reports did not reach conclusions that could be put to vote and acted upon as standard practice or recommended practice; there were those who thought that the reports were voluminous and profuse, besides being inconclusive.

We are quite certain that the best friends of the Association and those most closely concerned with its interests are its severest critics. The sort of criticism that we have described is unjust in that it is out of proportion. In truth, the reports of this Association are well up to the average of similar societies. Even the Master Car Builders' Association and the Master Mechanics' Association, with years behind them, have every year reports that are perfunctory, or that are pedantic, or that are diffuse and inconclusive; or for various reasons do not reach useful or manageable ends. The same thing might be said, indeed, of the Congress of the United States.

A committee report which really sums up a matter and permits a vote to be taken and the books to be closed, is in the nature of things, a rare production, and the members of the Maintenance of Way Association must not expect too much. Their organization is only now getting into working shape, and it has done uncommonly well for its brief working life. The zeal of its members, both in committee and in the general meeting, and the intelligence and ability with which its work has been laid out and discussed are quite remarkable. The reasons for the more or less general dissatisfaction with results are not far to seek and are in some degree capable of remedy. In some degree they are such as in the nature of things cannot be remedied.

The original plan is quite obvious. If one will look over the list of subjects as assigned to the 15 standing committees and will examine the synopsis of the work expected of each committee, it will be apparent that a complete report from any one of these committees, a report that might be adopted and close the subject, would be a treatise. Complete records from these 15 committees would be an encyclopedia of the civil engineering of railroads. But no one ever supposed that complete reports could be produced in one year or in five years. The obvious plan was to divide the big committees into sub-committees and to have special reports on parts of each general subject from year to year until perhaps in the end the whole could be disposed of as standard or recommended practice and laid aside till the art is developed further.

The job now is to get committees to make special reports that may be each, as far as it goes, thorough and approximately final.

The first step is to put on the committees men who will work. Probably the next step is to assign to the

committees men who live somewhat near each other. The objection is always raised to this that it is desirable to get a wide geographical range on any one committee, but almost any civil engineer has a sufficiently wide geographical range in his own experience.

A further suggestion was made at Chicago which seems to be a good one, namely, that reports should be published through the year in a monthly bulletin, and each month should be published in the bulletin, the discussions on the reports printed the month before. It goes without saying that each issue of the bulletin would contain not more than one or two reports. It seems to us that this is a promising plan. More work can be accomplished, and better work, by keeping a level of sustained interest than by trying to mass the interest in two or three days. If the members receive the bulletins month by month, they will have time to read and think over each topic, as they can never do under the present arrangement.

Annual Reports.

Texas & Pacific.—The annual report of this company for the calendar and fiscal year ending December 31, shows a larger increase in gross receipts than in any year since 1896, and the increases in all these years have been large. In this period gross receipts have grown from $6,825,100 to $11,769,900. Net earnings last year were $3,735,500, or 68¼ per cent. of the gross, which compares with a net of $1,671,600, or 75½ per cent. in 1896. The surplus over fixed charges last year was, in fact, larger by half a million dollars than net operating receipts six years ago. These enhanced revenues were secured on an increase of only 135 miles in operated road (total, 1,634 miles 1901). Of this increase 107 miles was added last year, due principally to the taking over of a line between Texarkana and Shreveport, 71 miles, and the construction of various branches in Louisiana. Last year's gain in gross receipts, $2,018,800, was equal to 20.7 per cent. over 1900, and amounted to $817 per mile of road, or 12.8 per cent., as compared with an increase in 1900 of $822 per mile, the largest which the company has ever shown.

This heavy gain in receipts last year emphasizes the development of the property and the building up of the country which it serves, and it was made in spite of a falling off in the cotton crop of Texas.

Part of the loss from the short Texas crop was made up by larger tonnage from a full crop along the Louisiana division, but there was nevertheless a loss of $65,000 in cotton revenues, which were $1,069,200, or 12¾ per cent. of the freight receipts in 1901, as against 16½ per cent. in the previous year.

Another feature of the revenue and traffic returns is the heavy increase in competitive traffic, although local business has furnished a good proportion of the new tonnage. Through traffic in 1901 accounts for $1,527,380 of the larger freight revenue and for 626,400 tons of the total increase of 901,400 tons in freight movement. The gross and net receipts and other items of the income account are reported below for three years:

	1901.	1900.	1899.
Freight earnings	$8,396,681	$6,869,302	$5,744,743
Passenger earnings	2,545,421	2,117,377	1,878,086
Gross earnings	11,769,942	9,751,121	8,300,186
Expenses:			
Maintenance of way	1,803,716	1,510,011	1,397,827
Maintenance equip.	1,392,353	1,122,834	883,162
Cond. transportation	4,527,553	3,671,582	3,284,756
General	310,828	277,204	283,121
Total operating exp.	$8,034,450	$6,581,631	$5,848,866
Net earnings	3,735,492	3,169,490	2,451,320
Other income	363,134	189,178	130,575
Total income	$4,098,626	$3,358,668	$2,581,895
Fixed charges	1,393,814	1,289,756	1,283,865
Taxes	291,484	276,328	249,344
Balance	$2,403,328	$1,792,584	$1,048,686
New buildings, etc.	249,932	173,005	419,584
New equipment	676,419	482,301	182,119
Total appropriation	$926,351	$655,306	$601,703
Surplus	1,486,971	1,137,278	446,983
Interest 2d mtg.	1,161,900	929,520	348,570

The increased earnings for 1901 enabled the company for the first time to pay the full five per cent. interest on the company's second mortgage bonds, of which there are $25,000,000, less $1,762,000 held in the company's treasury. Out of the 1901 earnings four per cent. was paid on these bonds, and out of 1899 1½ per cent., that being the first payment made. Nearly all these bonds are now held by the Missouri Pacific, that company having in 1899 made an issue of its own bonds to take up the Texas & Pacific securities, which through their voting rights virtually secure to it control of the Texas & Pacific.

While, with the deduction of this interest there does not appear a very large surplus in any of the last three years, it may be noted that in each year heavy special appropriations have been made for betterment work and for additional equipment. Further, maintenance work is heavy, equipment and roadway charges being 27 per cent. of earnings in 1901, and nearly 40 per cent. of the operating expenses. Maintenance of way charges alone were $1,100 per mile last year, and not much below that figure in 1900 and previous years, expenditures which are much above the average of neighboring roads. They compare with $905 per mile and $777 per mile, reported by the Missouri Pacific as maintenance of way expenses in 1901 and 1900 respectively. Texas & Pacific's development has, in fact, been accompanied with little increase in capital charges except for construction or purchase of new lines. On this account last year there was issued $2,424,000 Louisiana branch bonds.

Increased traffic was marked by further economies in cost of transportation. Ton miles were 882,755,600, an increase of 212,638,500, or nearly 33 per cent. over 1900 figures, while the increase in freight train miles was only 21 per cent., while with increased carloads the average trainload increased in the year by 16 tons to 195¼ tons, which compares with 153 tons in 1896, and 136 tons in 1892. Ton mile revenue in 1901 fell below one cent for the first time, the average being 9.5 mills. This was largely accounted for by shorter hauls on cotton, which takes high rates, and increases in low class rates. Of the 901,400 gain in number of tons moved, 666,000 tons was in freights like grain, minerals, lumber, and miscellaneous agricultural products.

Chicago, St. Paul, Minneapolis & Omaha.—The annual report of this company for the year to December 31 shows a heavily increased movement of traffic, and a large growth of earnings, despite smaller average rates. The ton-mile rate in 1901 was 9.61 mills, against 9.71 mills in 1900, and the average passenger mile rate was 2.318 cents, against 2.408 cents in the previous year. At the same time the average freight haul and average passenger journey have both increased. The number of passengers carried increased 10.86 per cent.; number carried one mile increased 15.8 per cent., and the passenger revenue was $277,524 larger, or 11.46 per cent. The number of tons moved was 7.78 per cent. higher, ton-mileage 8.92 per cent. larger, and freight earnings increased $575,047 or 7.84 per cent. The decrease in the ton-mile rate was 1.03 per cent., but freight train mile earnings were .85 per cent. higher ($2.37). Miles run by freight trains were 6.56 per cent. greater, but the average freight train load was 4.6 tons higher. Average passenger train mile earnings were 7⅓ per cent. higher. The principal changes in income and in traffic for a series of years are brought out below:

	Average miles.	Freight earnings.	Passenger revenue.	Ton-miles. (000 omitted.)	Pass. miles. (000 omitted.)
1901...	1,574	$7,913,796	$2,698,943	823,145	116,433
1900...	1,544	7,338,749	2,421,419	755,737	100,549
1899...	1,498	7,713,047	2,249,159	789,701	95,363
1898...	1,492	7,069,423	2,000,659	731,347	86,053
1897...	1,492	6,522,428	1,639,359	647,846	66,776
1896...	1,492	5,983,440	1,695,339	574,145	71,278

Gross earnings in this period have increased from $8,652,793 to $11,196,404, the operating ratio remaining substantially unchanged at about 63 per cent. Net earnings have increased $1,163,000 in this period. The net income from securities, etc., has added to this figure, and despite payment of 5 per cent. on the common shares against 2 per cent. in 1896, enlarging the dividend disbursement by $557,000, the surplus for 1901 was $413,525 against $340,901, the balance last year being after a deduction of $600,000 from surplus income for a betterment fund; and $500,000 was deducted similarly in 1900.

February Accidents.

We publish in another column of this issue a condensed record of the principal train accidents which occurred in the United States in the month of February. The record contains accounts of 48 collisions, 29 derailments, and 3 other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances occurred as follows:

3rd—Apple River, Wis.
10th—Haysville, Pa.
12th—Phalanx, Ohio.
13th—Little Rock, Ark.
14th—Allegrippus, Pa.
24th—Aurelius, N. Y.
24th—Conshohocken, Pa.
26th—Girard, Ohio.
27th—Zetella, Ga.

It will be observed that the five passengers reported as killed in this record were all killed in two collisions of freight trains (Apple River and Haysville) the passengers being drovers, riding in the cabooses. The newspaper accounts say that the collision at Apple River was due to the failure of the air-brakes on the train which ran into the standing train. It will be noted that the collision at Haysville occurred on a line which has been equipped with automatic block signals at great cost. This collision, according to the press reports, was very simply explained, by the engineman who was at fault, in the frank statement that he fell asleep. Some of the accounts add that he had been on duty so long that he was worn out. This part of the report, however, is not given as coming from the engineman's own lips, which suggests that it would be for the interest of all concerned to have the actual hours authentically reported in such cases. Many reporters seem to add this embellishment to their stories by force of habit. It is to be hoped that the Government accident reports, which the world is waiting for, will give the facts on this subject; for, if we may judge by the replies received in cases that we have inquired into, reports that collisions are due to men being overworked are false more frequently than they are true; though at the same time there is evidence enough that trainmen everywhere work very long hours when traffic is heavy.

The derailment at Phalanx was the most notable passenger-train accident reported in February, but none of the injuries to passengers was reported as fatal. The collision at Allegrippus, due to a runaway, is of the same kind as a number of other disastrous accidents which have occurred recently. In the absence of any explanation beyond the statement that the train was heavy and the rails slippery, the question of the use of retaining valves, to insure the efficiency of air-brakes on steep grades, becomes of increasing importance. A brief but significant paragraph in the last annual report of the Interstate Commerce Commission touches on this point; it is declared that the retaining valve is a necessity, but it is said that but few roads use it.

We have put the Conshohocken collision in our list of prominent cases, not because it was a very serious accident, but because it illustrates the value of unfailing block signals. In this case the temporary use of the time-interval resulted in a rear collision, though whether because too short an interval was prescribed or the flagman failed, does not appear.

The collision near Aurelius appears to have been due to gross negligence. The newspaper accounts have had a good deal to say about the despatching, and they say that the Coroner's investigation showed that the despatcher was censurable for some of his acts in connection with the train involved; but there were no train orders at all concerned in the case, and it was simply neglect of time-table rules. The engineman at fault was killed. The conductor says his watch was 20 minutes slow; but this explanation does not appear to be looked upon as entirely reasonable. The question how so great a variation came to go undiscovered when the whole movement occupied only a few minutes, is not satisfactorily cleared up. Such a serious disaster from such a plain cause only adds one more to the long list of disasters showing that the discipline of our trainmen is not equal to the problem of reducing our annual accident record, unless we adopt the space-interval. As long as we do not adopt that principle, and do not improve the discipline, our English friends will continue to speak of us as reckless railroaders.

The collision at Girard illustrates another feature in which the block system is not only useful, but necessary. On lines where there are four main tracks, it has come to be well understood that enginemen are constantly required to run at full speed in spite of the fact that red lights may be staring them in the face. Everybody understands that something besides time-tables and train-orders and flagmen must be provided if rear collisions are to be prevented. Here is a situation where the same consideration applies as regards butting collisions. If the prevention of these is going to depend, for one of its elements, on enginemen's seeing each other's headlights, the exclusion of unauthorized headlights will be necessary; but in the case of an independent parallel line this cannot be done. The two roads might agree that one of them should use tinted headlights, say blue, or yellow or pink; but that would be looked upon as hardly less grotesque than Marconi's suggestion that the wireless telegraph be used to prevent butting collisions. If electric headlights were to be used by two companies having lines running parallel for a considerable distance, the trouble would probably be increased, rather than diminished; because the additional distance at which the stronger light would be recognizable would increase the number of seconds or minutes that a runner would be in suspense as to whether a light in the distance was or was not on his track.

The number of electric car accidents in the United States in February was 12, in which 35 persons were injured. One of these accidents, a runaway on a hill, is reported to have been due to the failure of both air and hand brakes.

In our issue of Feb. 21, page 125, we gave some extracts from a paper on the wear of journals, presented by Mr. D. Van Alstine, Superintendent of Motive Power of the Chicago Great Western Railway, at the January meeting of the Northwest Railway Club. The figures given therein appear to be the result of very careful observation in different kinds of service for periods long enough to make the records reliable. It is stated by the author that, while the figures should not be taken as absolutely correct owing to the difficulty of keeping accurate records of journal wear, it was hoped they would be of interest. The matter is both interesting and valuable, and in condensed form the figures will probably answer questions that frequently arise on this subject, and be accurate enough for all ordinary use. We have combined the figures in a short table:

Kind of Axle.	Average life for ½-in. reduction in the diameter of journal account of wear. Years.	Mileage.	Removed on account of worn collars. Per cent.
Locomotive tender axles	14	490,000	5
Locomotive truck axles	7	245,000	..
Locomotive driving axles	13	476,800	..
Freight car axles (4¼ x 8)	30	274,000	29
Passenger car axles (4¼ x 8)	7	504,000	25

NEW PUBLICATIONS.

Review and Text of the American Standard Specifications for Steel. By Albert Ladd Colby. 16mo. 104 pages. Easton, Pennsylvania: The Chemical Publishing Company, 1902. $1.10.

Mr. Colby has re-written and condensed a paper which he presented at the International Congress on Testing Materials, in July, 1900; and this he now publishes along with the complete text of the specifications for steel which were adopted last August, by the American Section of the International Association for Testing Materials. Mr. Colby, it will be remembered, was a member of Committee No. 1 of the American Section and

acted as Secretary for that committee. The text of his book is a critical review of the work of this committee and the specifications upon which it agreed, giving the reasons which governed the committee in its decisions. The volume is useful therefore not merely in being a convenient form in which to have the specifications before one, but the review is important to the student. The American Branch of Committee No. 1 treated the requirements and tests of each specification under seven heads, namely: Process of Manufacture, Chemical Properties, Physical Properties, Test Pieces and Methods of Testing, Finish and Variation in Weight, Branding, Inspection. Mr. Colby reviews the requirements in general under these various heads; then he reviews in detail each of the nine specifications. These cover steel castings, axles, forgings, tires, rails, splice bars, structural steel for buildings, structural steel for bridges and ships, boiler plate and rivet plate.

Balancing of Engines, by W. E. Dalby, Professor of Engineering and Applied Mathematics in the City and Guilds of London Institute, Technical College, Finsbury. London: Edward Arnold.

This volume of two hundred and seventy odd pages presents an excellent mathematical treatment of the principles involved in balancing the revolving and reciprocating parts of engines. The author's methods are simple and direct. He has not crowded his pages with long and intricate mathematical formulæ, but has preferred to pass by relationships which are complicated, or to modify exact conditions in such a manner as to make easy a solution leading to an approximate result. The purely mathematical work, also, is supplemented by graphical methods, and all portions of the text are profusely illustrated. The book deals with the general principles involved, in balancing, revolving and reciprocating masses, and with the application of these principles to locomotive and to marine engines of different types. Theoretical considerations are supplemented by numerical examples. Various rules of practice in balancing are also presented. A chapter on the "Vibration of Supports" treats of the natural period of vibrations of structures of various forms and shows the destructive effects which disturbing elements may produce when their period of recurrence is in phase with the natural period of the structure in question. Those who, in their study of the balancing problem, have been led into difficult seas of tangled theories will find pleasure and smooth sailing in Professor Dalby's readable pages.

Civil Engineering as Applied in Construction; by Leveson Francis Vernon-Harcourt. Longmans' Civil Engineering Series. Octavo, 624 pages. Illustrations and index. London (New York and Bombay): Longmans, Green & Co., 1902. $5.00.

Mr. Vernon-Harcourt is more or less well known to our readers as the author of "Achievements in Engineering," "Docks and Harbors," etc. Some ten years ago he was asked to prepare the present volume, which has been greatly delayed, but probably, not without some gain, as the intervening years have given him broader knowledge and experience. The volume is really a condensed encyclopedia of civil engineering, and it is obvious that it could hardly be more, when we consider the vast field covered.

The book is divided into five separate parts, namely: Materials, Preliminary Works, Foundations and Roads; Railways, Bridges and Tunnels; River and Canal Engineering, and Irrigation Works; Dock Works and Maritime Engineering; Sanitary Engineering. These main parts are divided into 35 chapters, each dealing with a principal topic, as, for instance, one chapter treats of arched bridges, another chapter treats of canalization of rivers, etc.; but in the nature of things each one of these chapters must cover a considerable number of topics and examples; consequently, but little space can be given to any one subject. Under each heading or example are a few general facts and statements which will serve to show the reader in a broad way what has been done and to suggest to him where he may go to get further information on the subject which he is studying. There are numerous footnotes giving references to the authorities. The illustrations are very numerous, there being in all 368 numbers, but obviously these, like the text, can only give general information.

If the book is taken for what it is intended to be, namely, a convenient summing up of an immense number of examples, it will not be disappointing, and indeed will be found useful. Its usefulness is all the greater from the fact that it is provided with an excellent index filling 58 pages.

Train Accidents in the United States in February.

(Continued from page 228.)

ing collision between a freight train and an empty engine; five trainmen injured.

unf, 27th, 8 p.m., Seaboard Air Line, Tucker, Ga., freight train No. 22 broke through a trestle bridge and 10 cars fell to the stream below.

unf, 27th, 10 p.m., Atlanta, Knoxville & Northern, Apalachia, Tenn., a freight train was derailed by a landslide. The engine fell down a bank, and the engineman was badly scalded.

unf, 27th, 11 p.m., Southern Railway, Zetella, Ga., a passenger train broke through a trestle bridge which had been weakened by a flood and all of the cars except one passenger car fell into the stream. Four trainmen were killed and three passengers and one trainman were injured.

o, 27th, Gulf, Colorado & Santa Fe, Justin, Tex., a car in passenger train No. 5 caught fire and, with one other car, was destroyed.

rc, 28th, 4 a.m., Delaware, Lackawanna & Western, Chadwicks, N. Y., a train consisting of two locomotives and a caboose broke in two between the second engine and the caboose, just after passing a summit. The separation was not immediately noticed and the caboose soon ran into the engine with considerable violence. Five trainmen were injured. Considerable damage was done by the explosion of torpedoes in the caboose. A number of fusees in the caboose took fire and were destroyed.

rc, 28th, 11 p.m., Great Northern, Blanchard, N. D., a local freight train standing at the station was run into at the rear by a following freight and the caboose was wrecked. The fireman was killed; two passengers in the caboose and one trainman were injured, one of the passengers fatally. A blizzard prevailed at the time.

*xc, 28th, at Opelika, Ala., a freight train backing through a connecting track collided with another freight, wrecking several cars. The caboose took fire and, with three loaded cars, was burnt up.

unf, 28th, 10 p.m., Atchison, Topeka & Santa Fe, Holbrook, Ariz., a fast passenger train was derailed by sand which had drifted on to the track, and the engine, baggage car and dining car were overturned and wrecked. The engineman and fireman were injured.

unx, 28th, Norfolk & Western, Radford, Va., a freight train was derailed and wrecked, and a brakeman was killed.

TECHNICAL.

Manufacturing and Business.

J. G. Schreuder has been appointed Assistant General Manager and Chief Engineer of the Union Switch & Signal Company, effective March 11.

B. M. Jones & Co., sole representatives in the United States for R. Mushet's Special and Titanic steel and Taylor's best Yorkshire staybolt iron, have moved its Boston offices to 159 Devonshire street.

Among the orders recently received by F. M. Hicks, of the Hicks Locomotive & Car Works, Chicago, is one from the Seattle, Tacoma & Interurban Railroad for a 18 x 26 in., 50-ton freight locomotive, extra heavy construction; and one from the Choctaw, Oklahoma & Gulf for a 66-ft. private car.

The engineering firm of Alvord & Shields, Chicago, has been dissolved by mutual consent and Mr. J. W. Alvord will continue his consulting practice in matters pertaining to water powers, water supplies and appraisements, sewerage purification and financial examinations and reports. After April 1 his office will be at 1715 Marquette building, Chicago.

Iron and Steel.

George M. Bard has been elected Vice-President and General Manager of the Diamond State Steel Company of Wilmington, Del.

The Columbia Engineering Works of Brooklyn has been incorporated with $150,000 capital, by Donald McNeil, John McNeil and Jonathan Moore, of Brooklyn.

F. H. Rapley of London, England, has been appointed General Manager of the Engineering Department of the Pressed Steel Car Co., with headquarters at Allegheny, Pa.

D. Davies, Auditor of the Virginia Iron, Coal & Coke Co., and the Virginia Southwestern, Bristol, Tenn., will become general manager of both companies on April 1, succeeding B. L. Brass. His successor as auditor will be W. B. Bowles.

The Boston Bridge Works has filed articles of incorporation in Connecticut with $250,000, the incorporators being Ben Conger and Hiram G. Moore, of Groton, N. Y., and G. H. Williams, of Newton, Mass., and E. T. Peverly, of Chelsea, Mass.

A bill has been introduced in the Virginia Senate for a charter for the Norfolk & Hampton Roads Shipbuilding & Dry Dock Company. The plant is to be established on Elizabeth River, between Lambert's and Sewell's points. The capital stock is fixed at $10,000,000.

The National Machinery Co. has been incorporated in New Jersey, with a capital of $450,000. The incorporators are Augustus Rohn, Lewis Selle, Amandus Bettes, Tiffin, Ohio; Harris N. Reynolds, Dayton; Mesheck Frost, Toledo, and Francis B. Lee, Trenton.

The Boston Steel & Iron Co. has been incorporated in New Jersey, with an authorized capital of $1,000,000. The incorporators are F. M. Mabie, Geo. F. Maguire, Edward E. Deen, Herbert D. Cohen and Nathan F. Griffin, all of New York. The company will buy its raw material from the United States Steel Corporation.

The Maryland Rail Co. was chartered in Maryland March 20. The directors for the first year are Howard H. Dickey and Harry E. Weber, of Cumberland; Albert F. Baumgarten, of Pittsburgh; Nathan A. Taylor and William C. Dickey, of New York. The company was organized by Mr. Dickey, who has bought from the American Tin Plate Company its property in South Cumberland. The plant is now being overhauled and will start up May 1. The company will make rails and steel shafting.

Contracts were let on March 18 (Julian Kennedy, Consulting Engineer), to the Westinghouse Machine Co. for six vertical blowing engines for the blast furnaces of the Toledo Furnace Co. at Toledo, Ohio, and the South Chicago Furnace Co. in Chicago. Three of these engines will be installed at each furnace. Each set will consist of two high pressure and one low pressure engine. The high pressure engines will have cylinders 50 in. in diameter, with Corliss valve gear. The low pressure cylinders will be 96 in. in diameter. The air cylinders in all engines will be 96 in. in diameter and the stroke 66 in.

Signaling Notes.

The New York Central has completed a new interlocking plan at Oneida. The machine has 30 levers.

The Illinois Central is putting electric lamps into all its switch lights at Fulton, Ky., and Fort Dodge, Iowa.

The Catawissa branch of the Philadelphia & Reading, between East Mahanoy Junction and Lofty, Pa., is now worked by the telegraph block system, and the whole of the branch is to be thus operated before long.

The Colorado & Southern is now running its trains by the block system between Denver and Pueblo, 120 miles. The distance from station to station is usually four or five miles. Communication from station to station is by telephone.

The Cleveland, Cincinnati, Chicago & St. Louis has been extending the use of the block system. All trains are now run under this system between Indianapolis and Muncie, 54 miles; and the system will soon be extended eastward from Muncie to Cleveland.

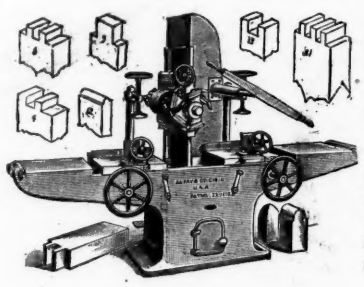
The Southern Pacific will put in a 28-lever interlocking machine at the drawbridge over Buffalo Bayou, near Houston, Tex. The work will be done by the Union Switch & Signal Company. The Southern Pacific will soon erect interlocking at the crossing with the Gulf, Colorado & Santa Fe at Galveston. The Chicago, Rock Island & Pacific is putting in interlocked-signals at its crossing with the Fort Worth & Denver City at Bowie, Tex.

Another Steel-Car Plant.

The American Car & Foundry Co. will build a new steel car plant at Berwick, Pa., to be a duplicate of the plant recently built at Detroit, which is probably the finest steel-car shop in the world. The company expects to have in the new shop a number of improvements which will make it even superior to the one at Detroit. The main car-erecting shop at the new plant will be 730 ft. long and 185 ft. wide. All machinery in the plant will be electrically driven and the best labor-saving devices and machinery will be used. The American Bridge Co. has the contract for the buildings, and the Westinghouse, Church, Kerr & Co., are doing the engineering. The plant will have a capacity of 10 to 20 steel cars a day.

A Vertical Car Tenoning Machine.

The tenoning machine shown herewith is especially for car shops, and other places where heavy timbers are worked. It will make double tenons on long car sills and heavy timbers without reversing, and will to advantage corner, bevel, smooth, rabbet, or cut down on sides of timbers by fixing the head and passing work over the table as when planing, or ends can be rounded, tenoned or molded in any shape desired.



The table is 8 ft. 8 in. long, and divided, thus forming two tables, each provided with a stop to gage the length of tenon, and can be lowered when timber has been placed on them. The cutter heads can be instantly set for different thicknesses of tenons. When the tenon has been made on one end the timber is moved over to the other table past the cutters, when the cutters are traversed back to complete the tenon on that end. The cutters are left in position for the next sill, and as both ends can be worked from the same surface the sill requires no reversal, thus saving time. Single, double or triple tenons are made with equal facility.

The makers, J. A. Fay & Egan Co., Cincinnati, Ohio, will furnish further particulars.

A New English Locomotive.

The Great Western Railway of England has just turned out at Swindon the first of a new class of passenger engines for the heavy grades found on their Western and Cornish lines. It marks the extreme limit of the clearances which the loading gage allows. The height is 13 ft. 2 in., the width is 8 ft. 11 in. over the cylinder lagging, and the boiler center is 8 ft. 6 in. above the rail. The front end is carried on a bogie with wheels 3 ft. 2 in., while the coupled wheels, of which there are 6, are 5 ft. 8½ in. in diameter. The boiler is unusually large and is 14 ft. 8 in. long and 5 ft. in diameter, giving a total heating surface of 2,400 sq. ft. The grate area is 27 sq. ft. and the fire-box is of the Belpaire type. The cylinders are 18 in. x 30 in. outside the frames, and the valves are piston. The tender is on six wheels and carries five tons of coal and 4,000 imperial gallons of water. The total weight of engine and tender is 105 tons.

The Chicago Clearing Yards.

Thursday afternoon, March 20th, on the invitation of Mr. A. Swanitz, Chief Engineer of the Chicago Union Transfer Ry., a party of members of the American Railway Engineering and Maintenance of Way Association was taken out to the yards of this company, recently completed, and fully described in the *Railroad Gazette* for March 14. A special train of the Chicago & Eastern Illinois took them to the yards. The party was first taken to the signal tower, where the electro-pneumatic control of the switches was explained, and some cars

switched to show how they worked. The rest of the time was spent in an inspection of the power station and roundhouse, and a trip to the west end of the yards.

Air-Brakes at Nashville.

Report of air-brake cars cut out leaving Nashville yard of the Nashville, Chattanooga & St. Louis Railway, February, 1902:

Number of air-brake cars forwarded	7,535
Number of air-brake cars O. K.	7,361
Air-brake cars cut out	174
Average serviceable air-brake cars per train	15.6

Of the 174 cars cut out, there were:

Blowing at exhaust	29
Blowing at vent port	1
Check valve case gasket blown out	4
Release valve leaking	11
Release valve broken	1
Brake cylinder gasket blown out	1
Brake cylinder piston broken	1
Release spring broken	2
Train pipe broken	5
Branch pipe broken	31
Flat wheels	69
Brake rigging out of order	19
Total	174

Of the 174 cars cut out, 146 belonged to railroad companies, and 28 to private car lines.

Air-brake cars cut out coming into Nashville yard:

Blowing at exhaust	51
Blowing at vent port	18
Triple valve needed cleaning	28
Triple valve gasket worn out	14
Triple valve piston packing ring worn out	13
Check valve case gasket blown out	18
Works emergency, service application	2
Release valve leaking	37
Release valve broken	2
Brake cylinder gasket blown out	1
Front cap gasket blown out	4
Brake cylinder piston broken	1
Release spring broken	2
Train pipe broken	11
Branch pipe broken	40
Unions leaking	24
Angle cock leaking	2
Brake rigging out of order	34
Flat wheels	74
Total	379
Cars leaving Nashville with brakes cut out	174
Cars repaired	205

The Draft Gear Tests.

Eleven different styles of draft gear have been furnished for tensile and compression tests at Purdue University and for drop tests at Altoona. These are the Westinghouse, the Sessions, the Piper, and that of the Railroad Supply Company, all friction gears; also the Sterlingworth, the Wright & Vance, the Minor, the McKee, the Hinson and the Thornburgh, spring gears. Several of these manufacturers have furnished more than one style of gear. Both the tests at Purdue and at Altoona are under way. Each draft gear maker is allowed to have a representative witness the tests of his own gear. Details of the methods for making these tests were described in the *Railroad Gazette* last December.

THE SCRAP HEAP.

Notes.

The Black Diamond Express, of the Lehigh Valley, which was taken off at the time of the great flood of February 28, was again put in service on March 24.

The summer coats of the passenger conductors on the Philadelphia & Reading are to be cutaways, and, according to a local newspaper, they are much handsomer than the frock coats hitherto worn.

A Buffalo paper says that the New York Central is carrying passengers from Buffalo to Niagara Falls and return, 22 miles and back, for 50 cents. This rate is made to compete with the electric line.

A passenger agent of the Atchison, Topeka & Santa Fe says that he has made a contract with the Government for the transportation of a body of troops 11,751 miles. This is from the Island of Porto Rico to the Philippine Islands.

The Attorney-General of the State of Washington announces that he is going to bring suit in the United States Supreme Court against the Northern Securities Company to prevent the merger of the Great Northern and the Northern Pacific. As all the corporations party to the suit are outside of Washhington, the question of jurisdiction, which caused Minnesota's petition to be denied, will be avoided.

The blizzard of March 13-15 in North Dakota was the worst that has occurred in that region in several years. The Northern Pacific, the Great Northern and the Soo Line were all blocked for several days. St. Paul dispatches of March 20, reporting the arrival of the first train from the Pacific coast after the storm, stated that the blockade of the Northern Pacific lasted 131 hours. On the Great Northern it lasted 144 hours. At Stanley, N. D., a passenger train was held between three and four days at a point where the passengers had no food, except such as could be got from the dining car on the train. The snow on the tracks was mixed with sand so that the rotary snow plow had to be constantly repaired.

Injunctions Against Secret Rates.

With the consent of the defendants and without a full hearing, Judge Grosscup, in the United States Circuit Court at Chicago, on Monday last issued the temporary restraining order forbidding secret rates asked for by the Interstate Commerce Commission against six railroads. The order holds good until June 1, or until further orders from the court. The railroads affected by the injunction are the Lake Shore & Michigan Southern, the Pittsburgh, Cincinnati, Chicago & St. Louis, the Pittsburgh, Fort Wayne & Chicago, the Michigan Central, the Illinois Central, and the Chicago & Northwestern. Before entering the order Judge Grosscup said:

"But for the compliance of the defendants I should have required the fullest possible hearing. The matter is one of extreme importance and not to be decided without the most mature deliberation. I will enter this temporary order with the reservation asked for by the defendants, that it shall be without prejudice to the rights of the railroads to move for the dissolution of the order. Such a motion may be made at any time before the final order is entered upon full hearing.

. . . "The question here is what power the Government has to enforce the provisions of the Interstate Commerce Act. If this application for an injunction can be maintained, it will make the courts of equity the masters of the maintenance of rates. Such a finding might also prove to be the vitalizing principle of the act.

"If any departure from the established rates is made by any of these railroads during the pendency of these orders, the court will take great pains to seek out the offender and provide against further violations."

It is believed that the railroads named agreed not to contest the petition for an injunction at this time in order that other roads eventually might be brought into court.

In addressing the court, before counsel for the railroad said no opposition would be made, Mr. Day for the Government declared that fewer men than can be counted on the fingers of the two hands enjoyed a monopoly in freight rates on grain and packing house products were to be shipped. The railroads, he said, ignored all law. While secret cutting of rates went on prior to the year 1901, during that year the companies became so bold that they openly and brazenly billed the freight at illegal rates.

The expected proceedings at Kansas City were had on Tuesday. Judge John F. Philips, in the United States District Court, issued a temporary restraining order against the eight Chicago-Kansas City and Kansas City-St. Louis railroads. It was mutually agreed that if the arrangement could be made the Kansas City and Chicago cases should be argued jointly at Chicago on June 23. The restraining order issued by Judge Philips is practically the same as that issued in Chicago by Judge Grosscup. The following named roads are affected by Judge Philips' order: Chicago & Alton, Chicago, Milwaukee & St. Paul, Chicago Great Western, Atchison, Topeka & Santa Fe, Chicago, Burlington & Quincy, Missouri Pacific, Chicago, Rock Island & Pacific, and the Wabash.

Philadelphia to Jersey City in 79 Minutes.

On Monday, March 24, a special train of an engine (No. 850) and two cars, carrying the President of the Pennsylvania Railroad, was run over that road, from Broad Street Station, Philadelphia, to the terminus at Jersey City, 89.76 miles, in one hour and 19 minutes (12:19 p.m. to 1:38), or at the rate of 68.17 miles an hour. This is the best time ever made over this line, though a similar run the day before was accomplished, in spite of a delay due to a hot box, in one hour and 20 minutes. In the run of Monday no stops were made. It is possible that a rate of 68 miles an hour for 90 miles has been made in a number of the fast runs for long distances that are on record; but of specific records that equal or exceed this we have only two: Albany to Syracuse, 147 miles, New York Central, Sept. 28, 1895, with two cars, 68.23 miles an hour; and Bath, N. Y., to East Buffalo, 104 miles, Delaware, Lackawanna & Western, July 9, 1899, at 69.3 miles an hour. This train had, we believe, not more than two cars.

Improvements on the Illinois Central.

This company has recently been experimenting with several improvements which are proving very satisfactory. The first innovation was the introduction of the telephone in the traffic department. Long distance telephones were connected with the regular wires of the company between Chicago and Cairo, a distance of about 300 miles, and the same wire that carried the telephone messages was used at the same time for despatching trains and for the commercial work of the company. Another recent idea which has been adopted after previous trial by the Chicago & Alton, is the photographing of wrecks and new work along the route in such a manner that the headquarters departments are at once made aware of the exact situation. This is of service in furnishing accurate reports of wrecks. A third idea which is now being introduced between Chicago and Cairo is the lighting of all yards by electricity, and all towns along the route using electric lights are now being asked to furnish bids for the work.

Technical Schools.

Rensselaer Polytechnic Institute.—A lecture on the American Isthmian Canal was delivered before the students of the Rensselaer Polytechnic Institute, Troy, N. Y., March 21st, by Foster Crowell, M. Am. Soc. C. E., of New York City. The lecture was illustrated by lantern slides and much interesting information regarding the Panama and Niacaraguan routes was given.

Santa Fe Improvements on Coast Lines.

According to reports from Los Angeles the Santa Fe system has plans made for considerable improvements on its coast lines. The company has already secured land at San Bernardino, Cal., adjoining its present shops to be used for new buildings. The cost of new car shops will be $40,000; paint shops, $27,000; transfer tables, $10,000; additions to the boiler shops, $4,500; and new machinery, $31,000; brass foundry, $3,500; tracks, $16,000; steam and sewer pipes, $10,000; engine hoist, $5,800.

New eating houses are to be built at Merced and Bakersfield.

New bridge work to be done on the Santa Fe Pacific, all steel, will be at a cost of $133,000.

At Seligman there is to be a new steel water tank to cost $5,000, and the yards there are to be remodeled at a cost of $12,000.

At Needles sixteen stalls are to be added to the roundhouse, at a cost of $26,000. Along the line of the road in Arizona new tool houses are to be built at a cost of $14,000.

The grand total cost of these improvements is nearly $430,000.

Inter-urban Roads in Iowa.

A bill known as the Inter-urban Railway Bill, which grants the right of eminent domain to inter-urban electric lines, allowing them to use the highway and applying to them the laws relating to railroad corporations, passed the Iowa House last week and was amended and passed by the Senate a few days later. The Amendment adopted by the Senate prevents inter-urban lines from carrying freight in cities as street car lines. That is, they may work within city limits for the purpose of carrying passengers, baggage, mail and express, but if they haul freight, they must use the streets in the same way that steam railroads do and become liable to abutting property owners for damages. This amendment does not prevent such inter-urban lines from paying tolls for the hauling of freight to existing steam railroads within cities, but to street railroads already established within such cities which have been granted the right to haul freight.

LOCOMOTIVE BUILDING.

The Philadelphia & Reading is having 10 locomotives built at the Baldwin Works.

The Georgia, Florida & Alabama is having one locomotive built at the Baldwin Works.

The Cananea Consolidated Copper Co. is having a locomotive built at the Baldwin Works.

The Chicago, Indianapolis & Louisville has ordered two locomotives from the Brooks Works.

The Iowa & St. Louis is in the market for two locomotives. H. F. Reddig, Kansas City, is President.

The Burlington, Cedar Rapids & Northern has ordered five locomotives from the American Locomotive Co.

The Copper Range is having two locomotives built at the Dickson Works of the American Locomotive Co.

The Baltimore & Ohio is having 33 locomotives built at the Richmond Works of the American Locomotive Co.

The Canadian Pacific is having nine locomotives built at the Schenectady Works of the American Locomotive Co.

The Bessemer & Lake Erie is having 10 locomotives built at the Allegheny Works of the American Locomotive Co.

The Alabama Great Southern is having two locomotives built at the Richmond Works of the American Locomotive Co.

CAR BUILDING.

The Maine Central is having 50 freights built at the Laconia Car Works.

The St. Louis & San Francisco is having 10 coaches built at the Pullman Works.

The Detroit & Charlevoix is having 10 freights built at the Russell Wheel & Foundry Co.

The Southern Pacific has ordered 200 stock cars from the American Car & Foundry Co.

The Chicago & North Western is having 2,000 freight cars built at the Pullman Works.

The McCaw Mfg. Co. has ordered 25 tank cars from the American Car & Foundry Co.

Reid's Newfoundland R. R. has ordered 100 flat cars from the American Car & Foundry Co.

The Philadelphia & Reading has ordered 20 tank cars from the American Car & Foundry Co.

The American Car & Foundry Co. has orders for 66 cars of various types for miscellaneous parties.

The Canadian Pacific has ordered 500 freight cars from Rhodes, Curry & Co. in addition to the 500 recently ordered.

The Galveston, Houston & Henderson is having two freight cars built at the St. Louis Works of the American Car & Foundry Co.

The Chesapeake & Ohio has ordered 1,000 box and 200 coal cars from the Pullman Co., and 100 coke cars from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific has ordered 1,300 box, 300 gondola, 200 stock and 100 refrigerator cars from the American Car & Foundry Co.

The Missouri, Kansas & Texas has ordered 100 convertible Rodger ballast coal and flat bottom gondola cars, to be 34 ft. long with 4-ft. sideboards and 80,000 lbs. capacity, for June delivery.

The St. Louis, Troy & Eastern has ordered 200 coal cars of 80,000 lbs. capacity from the American Car & Foundry Co., to be built at the Madison Works. E. C. Donk, St. Louis, is General Manager.

The Arkansas & Choctaw order with the American Car & Foundry Co. calls for the following 16 cars to be built by the American Car & Foundry Co.: Four first-class, four second-class, four combination baggage and express, and four combination passenger and mail, all for August and September delivery. They will be 60 ft. 10 in. long and 9 ft. 8 in. wide. The special equipment includes: Steel axles; Westinghouse air-brakes; M. C. B. couplers; Pantasote curtains; Safety Car Lighting & Heating Co.'s heating system; cast-iron journal boxes; oil lighting and 36 in. steel tired McKee-Fuller wheels.

The St. Louis, Kansas City & Colorado order with the Pullman Co. mentioned in our issue of March 14 calls for the following eight passenger cars to be built by Pullman: Two first-class, two second-class, two combination baggage and express and two combination passenger and mail, all for October and November delivery. They will be 60 ft. long and 9 ft. 10 in. wide and Pullman standard underframes will be used with ⅞ in. blocking throughout. The special equipment includes: Steel axles; double 6 x 1 in. bolsters; National-Hollow brake-beams; cast-iron brake-shoes; Westinghouse air-brakes; M. C. B. couplers; Pantasote curtains; cast-iron journal boxes; Pintsch gas lighting; Standard steel platforms, and 36 in. McKee-Fuller wheels.

BRIDGE BUILDING.

Albion, Ill.—The County Commissioners are receiving bids for some steel bridges. Ben. L. Mayne, County Clerk.

Alexandria, La.—The contract will be let on April 10 for a bridge by the committee of which Ed. Hopkins is Chairman.

Alexandria, Minn.—Bids are wanted until 7:30 p.m., March 31, by Geo. S. Campbell, Village President, for a bridge over Long Prairie River.

Allentown, Pa.—The County Commissioners have sold the iron in the three bridges destroyed by the February flood for $2,155.

Atlanta, Ga.—According to report, a bridge is to be built over the tracks of the Southern and Western & Atlantic Railroads near Ellen N. Station.

Aurora, Ill.—The City Council has granted permission to the street railroad company to build a bridge over the east branch on Main street.

Baltimore, Md.—The Maryland & Pennsylvania R. R.

will build a combination bridge over Little Gunpowder River; also a viaduct 400 ft. long at the Overshot crossing. Contracts are to be let soon.

BAY CITY, MICH.—Bids are wanted by the Bay County Bridge Commission, J. H. Bloomshield, Engineer, until April 12, for a bridge at Cass avenue, and for other work.

BELVIDERE, N. J.—The Freeholders of Warren County are considering spending $7,000 on rebuilding bridges. Maurice S. Frost, Clerk of Freeholders.

BOSTON, MASS.—City Engineer Wm. Jackson, in a report to the Mayor on widening or rebuilding all the bridge draws over Fort Point Channel so that each will have a 50 ft. passageway, says that the changes to the Congress street bridge will cost about $31,470; the Mount Washington avenue bridge about $89,607. He says it is not feasible to rebuild the Federal street draw, but that a new bridge should be built, and that a steel bridge 92 ft. wide on masonry piers would cost $422,000. It will cost about $56,507 to put in a new draw in the Dover street bridge.

The Harbor & Land Commissioners have under consideration the superstructure for the bridge across Fort Point Channel from Cove street.

The Cambridge Bridge Commission is considering the form of superstructure for the Cambridge bridge which was described and illustrated in the *Railroad Gazette* Feb. 28, p. 145. The superstructure will probably consist of steel arches. The piers are finished and cost $450,000.

BUFFALO, N. Y.—On March 19 a bill was introduced in the House of Representatives and referred to the Committee on Interstate and Foreign Commerce authorizing the Mather Power Bridge Co., of New York, to build in the Niagara River near Buffalo an experimental span for a power bridge.

CEMENTON, PA.—It is reported that a new bridge is to be erected over the river here to replace the old structure, which was much damaged by the last flood.

CHAMBERSBURG, PA.—The Cumberland Valley R. R., according to a statement in its annual report, will spend about $200,000 this year on continuing the elimination of grade crossings.

COLORADO SPRINGS, COLO.—W. J. Palmer has made an offer to the city to pay part of the cost for a new bridge over Monument Creek at the Mesa Road.

COLUMBUS, OHIO.—In addition to the bids which County Auditor L. E. Jones will receive on April 9, he is receiving bids until April 4 for a lot of miscellaneous bridge work. Further information can be had from him.

The County Commissioners are considering a site for a viaduct over the tracks of the Big Four on West Broad street.

CROOKSTON, MINN.—Bids will be wanted in April for the two bridges on Main street over the Red Lake River. G. A. Ralph, Engineer.

DECATUR, IND.—Bids are wanted April 22 for building 12 steel bridges; also for some stone arches. Samuel Doak, Chairman, County Commissioners.

DOVER, DEL.—The Kent County Levy Court is considering building a new bridge at Silver Lake.

EGANVILLE, ONT.—A new bridge will be erected over the Bonnechere River at a cost of $15,000.

ELK RIVER, MINN.—It has been voted to issue bonds for a bridge across the Mississippi.

ELLICOTT CITY, MD.—The County Commissioners have decided to build a bridge over Alcorn Branch on the public road near Simpsonville.

ELYRIA, OHIO.—The City Engineer has been ordered to make plans for a stone arch bridge at Washington avenue.

ERIE, PA.—City Engineer B. E. Briggs tells us that there is no appropriation for bridges, so the bridge proposed over Mill Creek will not be built this year.

HACKENSACK, N. J.—The Board of Freeholders is considering rebuilding some of the bridges that were destroyed by the freshet last month. The Clifton avenue bridge will probably cost $5,000. In all about $12,000 will be spent.

HARRISBURG, PA.—Middletown Township Council will likely accept the proposition of the Pennsylvania Railroad Co. to build subways at Union and Wood streets to cost $25,000 each, also a new station to cost $10,000. The work will be begun as soon as the necessary ordinance is passed.

Viewers have recommended to the Court the rebuilding of the bridges over Loyalsock Creek, Plunkett's Creek and Lycoming Creek in Lycoming County, and their reports have been approved by the court.

Viewers have also recommended the building of a bridge over Larry's Creek in Pratt Township, Lycoming County.

Viewers have been appointed on a proposed new bridge over Manada Creek near Shellsville.

KANSAS CITY, KAN.—The county has made an appropriation for a bridge over Wolf Creek. Bids will soon be wanted. Frank M. Holcomb, County Clerk.

KANSAS CITY, MO.—The contract for the approaches and piers of the Allen avenue viaduct is let to V. W. Florence by the Metropolitan Street Ry. Work has been begun and it will cost $26,000. The contract for the superstructure will probably be let in the near future.

LEWISTOWN, PA.—The Pennsylvania R. R. will build a subway under the tracks at Miffin Station.

MADISON, NEB.—Bids are wanted by Emil Winter, County Clerk, until April 22 for building all bridges ordered by the county during the year 1902.

MAUCH CHUNK, PA.—It is doubtful if the Mansion House bridge at this place, in which both railroad companies were jointly interested, will be rebuilt. The Lehigh Coal & Navigation Co. is building a ferry to replace the old bridge.

MONTPELIER, VT.—An officer of the Central Vermont R. R. writes that plans have not yet been made for the new bridge over the Winooski River to replace the structure washed away by the freshet.

MOUND CITY, ILL.—New bids will be wanted by Lieutenant Colonel C. R. Barnett, Depot Quartermaster at St. Louis, Mo., for the steel bridge to be built at Mound City, as the bids received on March 7 were rejected.

NEW PHILADELPHIA, OHIO.—Bids are wanted, April 18, for building stone abutments for a bridge over Sugar Creek in Franklin Township. C. G. Fernsell, County Auditor.

OGDEN, UTAH.—Bids are wanted at 2 p.m. April 7, for two spans of 70 ft. each, steel highway bridge with 18 ft. roadway. Address the Town Clerk.

PHOENIXVILLE, PA.—The Royersford Electric R. R. Co., according to report, is considering building its own bridge over the Schuylkill River at Black Rock in extending its line to this city.

PONCE, PORTO RICO.—A committee will be appointed to consider the advisability of building a bridge over Portuguese River.

QUINCY, MASS.—The Fore River Ship & Engine Co. of Quincy has been awarded the contract for the drawbridge over Weymouth Fore River. The other bidder was the United Construction Co., of Boston.

READING, PA.—Viewers have been appointed on a new bridge over the Tulpehocken Creek in Marion to replace the bridge washed away in the flood of February 28.

REVELSTOKE, B. C.—A new steel bridge will be erected over the Columbia River at this place at a cost of about $30,000.

REXFORD FLATS, N. Y.—The Schenectady Ry. Co. will build a steel bridge about 625 ft. long over Mohawk River near Rexford Flats. R. H. Fraser, Vice-President, Schenectady.

RILEY, KAN.—Bids are wanted until 1:30 p.m., March 29, for building two bridges for the county. B. J. Ames, County Clerk.

ST. CHARLES, MO.—Congress has extended the time in which the St. Louis, St. Charles & Western Ry. has to complete its bridge over the Missouri River at St. Charles until 1904. J. D. Horseman, General Manager, St. Louis.

SARNIA, ONT.—The Dominion Parliament has extended the time in which the River St. Clair Bridge & Tunnel Co. is to build a bridge over St. Clair River at this town.

SHREVEPORT, LA.—On March 21 a bill was introduced in the United States Senate and House of Representatives authorizing the Shreveport Bridge & Terminal Co. to build and maintain a bridge across Red River in Louisiana at or near Shreveport.

The city is reported considering building a steel bridge about 500 ft. long. F. W. Kane, City Engineer.

SIDNEY, OHIO.—Bids are wanted April 5 for a bridge over Loramie Creek near Lockington. R. B. Dill, County Auditor.

SPENCERPORT, N. Y.—The village of Spencerport and the New York Central R. R. have made an agreement in regard to building a bridge over Union street.

WEST CHESTER, PA.—The Royersford Electric Railway Co. may build its own bridge over the Schuylkill River at Black Rock.

WEST ELIZABETH, PA.—On March 18 a bill was introduced in the House of Representatives and referred to the Committee on Interstate and Foreign Commerce authorizing the West Elizabeth & Dravosburg Bridge Co. to build a bridge across the Monongahela River.

WILLOUGHBY, OHIO.—The Commissioners of Lake County at Painesville are considering the advisability of building a bridge across Chagrin River at Willoughby Township. The cost is not to exceed $30,000. John E. Post, Chairman of Commissioners.

WINDSOR, ONT.—The Dominion Parliament has extended the time, two years, in which the bridge is to be built between Windsor and Detroit by the Canada-Michigan Bridge & Tunnel Co.

Other Structures.

AKRON, OHIO.—A new passenger station will be built this spring by the Northern Ohio Railroad.

ALLIANCE, OHIO.—The Standard Bolt & Manufacturing Co., recently incorporated, will build a plant of brick with slate roof—the main building 70 by 208 ft., and the boiler house 34 by 34 ft. The officers of the company are: W. K. Fogg, President; P. M. Haas, Vice-President, and E. E. Scranton, Secretary and Treasurer.

Ground has been broken for the new shops of the Alliance Machine Company. The site is along the Cleveland & Pittsburgh Railroad, in the southern suburbs of the city. The company will build machinery of all kinds.

ANDERSON, IND.—The machinery supply house and machine shops of the Union Traction Co. in Anderson were destroyed by fire March 15.

AUSTIN, TEX.—The Houston & Texas Central is receiving bids until April 8 at Houston, Tex., for the new passenger station at Austin.

BROOKLYN, N. Y.—A director of the Brooklyn Rapid Transit Co. is reported as saying that not more than $5,000,000 of the $150,000,000 of bonds authorized at the meeting last week will be used at present. The proceeds, he said, will be used for improvements, including cars and a large power house.

CANTON, OHIO.—The Stark Rolling Mill Co. has had plans made for two 35-ton open-hearth furnaces, and is also considering building a Bessemer steel plant in place of the open-hearth furnaces. Julian Kennedy, of Pittsburgh, is the Engineer.

COLUMBIA, TENN.—The city officers have word from the Louisville & Nashville R. R. that it is considering building a new passenger station in Columbia.

COLUMBUS, OHIO.—The Jeffrey Manufacturing Co. will build a two-story machine shop 350 x 110 ft. adjoining its present plant.

CONNELLSVILLE, PA.—The Fisher Foundry & Machine Co., which has a plant on the Southside, Pittsburgh, is said to be considering removing to Connellsville.

FREMONT, NEB.—The Fremont, Elkhorn & Missouri Valley proposes to build a new station at a cost of about $40,000 in this city.

HARRISBURG, PA.—The contract for the Philadelphia & Reading passenger station at Harrisburg is let to L. H. Focht, of Harrisburg.

HOBOKEN, N. J.—The Phœnix Line, it is said, will build steel piers to replace those destroyed by fire.

LONDON, ONT.—The car repair shops of the Canada Atlantic on Elgin street were destroyed by fire March 21. Two passenger coaches, a combination passenger and baggage, two freight cars and a wrecking derrick were destroyed.

MINNEAPOLIS, MINN.—The American Bridge Co. is said to be planning large extensions to the Gillette-Herzog plant.

NEW ORLEANS, LA.—The Illinois Central, according to report, will soon announce its plan for extensive improvements at the union station in New Orleans.

PITTSBURGH, PA.—The Carnegie Steel Co. has begun work on the addition to its armor plate works in Homestead. The cost of the enlargements will be about $3,500,000, and will be in every department of the works. The new structure will be of steel and the work is to be done by the Keystone Bridge Works. Contracts for additional machinery have been awarded for some time. New machine shops and accessory buildings are to be put up and old ones removed. It is expected that the improvements will require a year to complete. Bethlehem Steel Company is also being enlarged to about equal size.

QUEBEC, QUE.—Bids are wanted by Fred. Gelinas, Secretary of the Department of Public Works at Ottawa, until April 3, for building an iron foundry in Quebec. Plans may be had at his office or at the office of the Clerk of Works at the Post-office in Quebec.

RONDEAU, ONT.—The Lake Erie & Detroit River R. R. will build a coaling plant at this place at a cost of about $75,000, also a dock 400 ft. long.

ST. PAUL, MINN.—Plans for the Great Northern's Dale street shops in St. Paul have been filed with the building inspector of that city. They provide for five large buildings of steel and concrete, each one-story high, to cost, exclusive of machinery, $250,000. The principal building, the machine shop, will be 150 x 600 ft. The boiler shop will be 235 x 425 ft.; the general storehouse, 100 x 452; the power house, 30 x 150 ft., and another storehouse, 100 x 200 ft.

SIOUX CITY, IOWA.—Plans were given out last week for the new station for the Chicago & North Western in Sioux City. The estimated cost is $200,000. In connection with the station a viaduct or a subway will be built and contracts for all this work are apt to be let soon.

SYRACUSE, N. Y.—A building permit has been issued to the New York Central & Hudson River R. R. for its new freight house at West and Water streets. It will be a steel and brick structure 552 ft. long by 50 ft. wide. The estimated cost is $125,000.

WAPAKONETA, OHIO.—The Western Ohio Electric Ry. is considering building car shops and barns in this city.

WASHINGTON, D. C.—Plans for the proposed union station for the Pennsylvania R. R., made by David H. Burnham, of Chicago, were placed on exhibition in the Senate District Committee room last week. The style of architecture is Roman, and the whole structure will be built of white marble. The station is proposed to be 760 ft. wide and about 751 ft. long. The car shed will be about 1,600 ft. long and 125 ft. high. The cost will be about $5,000,000.

WHEATLAND, PA.—The Sharon Foundry Co. has let a contract to Riter & Conley for its new foundry at Wheatland.

WORCESTER, MASS.—The Boston & Albany R. R. has plans made, according to report, for its new freight office and a 50-ft. addition to the west end of the present freight house.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xix.)

Canadian Society of Civil Engineers.

At the ordinary meeting on Thursday, March 27, an abstract on "A Short History of the Engineering Works of the Suez Canal," was read. Discussion was held on Mr. J. S. Costigan's paper on "Data and Notes Derived from Tests on Cement, and also on Concrete taken from regular batches used in Actual Works."

American Street Railway Association.

The twenty-first annual meeting of the American Street Railway Association will be held in the Light Guard Armory, Detroit, Mich., Wednesday, Thursday and Friday, October 8, 9 and 10. Papers will be presented on the following subjects: "The Registration of Transfers"; "Benefit Associations"; "Discipline of Employees by the Merit System"; "The Transportation of Light Express and Parcel Delivery"; "Steam Turbine Engines"; "Signals for Urban and Interurban Railways," and "The Adjustment of Damage Claims."

There will be an exhibition of street railroad supplies and Thursday, October 9, will be devoted to the examination of the exhibits. No session of the Association will be held. The annual banquet will be held on Friday evening, when the officers-elect will be installed.

The headquarters of the Association will be at the Cadillac Hotel. Other first-class hotels are: Russell, Wayne, St. Clair, Normandie, Griswold and Metropole. Particulars regarding the meeting will be given later.

PERSONAL.

—Mr. Arthur J. Wood, formerly and for three or four years on the editorial staff of the *Railroad Gazette*, has been appointed Professor of Mechanical and Electrical Engineering at Delaware College, Newark, Ohio. Mr. Wood is the son of the late Prof. De Volson Wood, is a graduate of Stevens Institute, class of 1896, and has been an instructor at the Worcester Polytechnic Institute since he left the *Railroad Gazette*, two years ago.

—Mr. William L. Hoffecker, who was for a number of years Master Mechanic of the Elizabethport shops of the Central Railroad of New Jersey, and who resigned from this position when the present management took charge, died March 18, at the home of his son, Dr. A. E. Hoffecker, at Elizabeth, N. J. Mr. Hoffecker will be well remembered by a great many railroad men, especially in the East, as he was a regular attendant at the meetings of the New York Railroad Club.

—Mr. E. E. Loomis recently assumed entire charge of the coal mining and marketing of the Delaware, Lackawanna & Western, with the title of Manager. He began his railroad career in 1883 in clerical work. In 1894 he became Superintendent of the Tioga Division of the Erie, and some three years ago he went with the Delaware, Lackawanna & Western in charge of the mines and mining properties. Mr. Loomis is also President of the Bangor & Portland and the Lackawanna & Montrose.

—Mr. W. M. Paul, Master Mechanic of the Galveston, Houston & Henderson, was born at Sandusky City, Ohio, in 1865, and entered the service of the Baltimore & Ohio in 1880 as a machinist at Chicago, Ohio. In 1885 he went to Garrett, Ind., in a similar capacity. This posi-

tion he held for two years, at the end of which time he left the service of the Baltimore & Ohio to go with the Cleveland, Cincinnati, Chicago & St. Louis. In 1890 he was appointed gang foreman and two years later was promoted to be General Foreman and held this position until he went with the Wabash as General Foreman at Tilton, Ill., in 1898. In 1900 he was transferred to Ft. Wayne, Ind., and has held this position until his recent appointment.

—The new Master Mechanic of the Albuquerque Division of the Santa Fe Pacific, Mr. F. P. Barnes, was born in 1861. At the age of 18 Mr. Barnes entered the shops of the Chicago & North Western at Winona, Minn. In 1887 he went to the Northern Pacific as a machinist, and a few months later was made foreman of the shops at Fargo, North Dakota, where he remained until 1893, at which time he was made General Foreman of the main shops at Brainerd, Minn. He was then appointed Master Mechanic of the Rocky Mountain Division. This was in 1898, and was at the time the Northern Pacific was developing its heavy power and naturally Mr. Barnes had the handling of a large portion of this on the Mountain Division.

—Mr. E. L. Hurley, who was recently appointed Resident Engineer of the River Division of the New York Central & Hudson River, was born in Newark, N. J., in 1875. After completing his course of civil engineering at Rutgers College in 1895 he entered upon his first practical work as a chainman on the Central Railroad of New Jersey and served under Mr. J. H. Thompson, Chief Engineer, with the exception of about ten months, until 1900, when he became Assistant Engineer of the New York Central. In connection with Mr. Hurley's duties under Mr. Thompson he held the position of City Engineer of Rahway, N. J., from 1899 until his appointment as Assistant Engineer, and served in the latter position until his appointment as stated above.

—Mr. H. Pierce, the new Superintendent of the Greenbrier Division of the Chesapeake & Ohio, was born at Quaker Hill, N. Y., in 1859, and was graduated from Cornell University in 1880. The following year he became a leveler and draftsman on the Cincinnati & South Eastern. This position he held for one year, and from 1882 to 1883 was draftsman on the Cincinnati, New Orleans & Texas Pacific. Then for six years Mr. Pierce was with the Cincinnati, Hamilton & Dayton, being successively draftsman, track supervisor and Engineer of Maintenance of Way, and from 1889 to 1901 he had charge of construction on the Western Division of the Chesapeake & Ohio. In March, 1902, he was appointed Superintendent of the Greenbrier Division. As will be seen, Mr. Pierce has not, as indicated in various notices, the title of General Agent.

—Mr. L. L. Smith, who in February last became Division Master Mechanic of the Chicago Great Western at Ft. Dodge, Iowa, is 33 years old and is a native of Islip, N. Y. He was graduated from Sibley College, Cornell University, in 1890, and entered the service of the Chicago, Burlington & Quincy in August of the same year. After completing his apprenticeship he was assigned to special work in the motive power department, and later filled the positions of draftsman, inspector of materials, foreman of the Brass Foundry at Aurora, Ill., and roundhouse foreman at Streator, Ill. In 1899 Mr. Smith became Master Mechanic of the Northwest Division of the Chicago Great Western, and the following year became General Shop Foreman and continued to discharge these duties until his new appointment as above. Mr. Smith is an Associate Member of the American Society of Mechanical Enginers.

—Mr. O. G. Cheatham, who has been in charge of shops and roundhouses for the past 11 years and who has succeeded Mr. Burton as Master Mechanic of the Seaboard Air Line, was born in Chesterfield County, Va., in 1865. His first railroad service was with the Richmond & Danville, becoming a machinist in 1884. Five years later he took a similar position with the Central of Georgia. After serving this company for one year he resigned to go to the Savannah, Florida & Western. From this position he went to the Savannah, Americus & Montgomery, but returned to the Central of Georgia in 1891. In 1894 Mr. Cheatham accepted a position with the Florida Central & Peninsular as General Foreman and remained with this company for five years. He then went with the Southern Railway as roundhouse foreman, later becoming General Foreman, which position he held until his recent appointment as stated above.

—Mr. Bryan Donkin died at the Grand Hotel in Brussels on March 4. He died suddenly of heart disease and had been engaged in some engine trials on the day of his death. He was in his sixty-seventh year, having been born in 1835. His father was John Donkin, a well-known engineer and his grandfather was Bryan Donkin, a man of excellent scientific attainments. The grandfather founded works for the manufacture of paper-making machinery at Bermondsey, and various members of the family were active in these works, and the younger Bryan Donkin became a partner in 1868 and chairman of the company (then a stock company) in 1899. But while he was successful and even distinguished as a manufacturer, he is better known to engineers as a student and an investigator and author. He began years ago his careful work on the investigation of engines and boilers and even in February last, he prepared a report, which he had not yet signed, on some boiler tests. With his investigations of steam engines and boilers, he has in the last dozen years carried on a careful study of internal combustion engines and has written a standard work on the "Gas Engine" and translated Diesel's work on "The Theory and Construction of the Rational Heat Motor." In 1898 he published a book on steam boilers, and he wrote with considerable frequency for the various institutions and societies of which he was a member. He was a Vice-President of the Institute of Mechanical Engineers (England), a distinguished member of the Institution of Civil Engineers (England), a member of the American Society of Mechanical Engineers and a member of various European technical societies.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—C. A. Morse has been appointed Principal Assistant Engineer, with headquarters at La Junta, Colo., with jurisdiction over the Western Grand Division. The position of Resident Engineer at Pueblo, formerly held by Mr. Morse, has been abolished. The Pueblo office will be handled by an assistant engineer. The Pan Handle Division has been transferred from the jurisdiction of Resident Engineer M. N. Wells at Chanute, to that of Resident Engineer W. H. Earl, at Newton, and the Oklahoma Division has been transferred from Mr. Earl to Mr. Wells.

Atlantic City.—See Philadelphia & Reading.

Baltimore & Ohio.—On April 1, the following changes will be made in the organization of the Accounting Department: Comptroller, H. D. Bulkley; Assistant Comptroller, G. W. Booth; General Auditor, J. T. Leary, succeeding Mr. Booth; Auditor of Subsidiary Lines, J. L. Kirk; Auditor of Revenue, J. M. Watkins; Auditor of Disbursements, G. B. Howarth; Assistant Auditor (Merchandise Receipts), F. D. Hodgson; Assistant Auditor (Coal & Coke Receipts), C. C. Glessner; Assistant Auditor (Passenger Receipts), C. H. Poumairat, and Supervisor of Traveling Auditors, J. A. Smith. The following Special Agents have been appointed: James Bartol, G. H. Pryor and Wm. McGowan. C. S. Sims, heretofore Division Superintendent of the Pennsylvania Company (Southwest System), at Chicago, has been appointed General Superintendent of the B. & O., with headquarters at New York, succeeding J. Van Smith, resigned. J. G. Bloom has been appointed Division Engineer of the New Castle Division, with headquarters at New Castle, Pa., succeeding A. M. Sprigg, resigned, and J. H. Abbott becomes Division Engineer of the Cleveland Division, at Cleveland, Ohio, succeeding W. B. Hanlon, transferred to the Chief Engineer's Department. The purchase and distribution of fuel will be under the direct charge of F. D. Casanave, General Superintendent of Motive Power.

C. Vadakin, Division Engineer of Maintenance of Way, with headquarters at Newark, Ohio, has resigned.

Canadian Pacific.—J. F. Fowler has been appointed Master Car Builder, with headquarters at Montreal, Que., succeeding W. Apps.

Chicago, Rock Island & Pacific.—C. H. Warren, heretofore Vice-President of the Central of New Jersey, has been appointed Assistant to the President of the C., R. I. & P., with headquarters at Chicago, Ill.

Denver & Rio Grande.—It is reported and probably true that F. W. Egan, heretofore Division Superintendent of the Grand Trunk, has been appointed General Superintendent of the D. & R. G.

Elgin, Joliet & Eastern.—A. H. Westfall, Assistant Superintendent of the Chicago, Lake Shore & Eastern, has been appointed General Superintendent of the E., J. & E., with headquarters at Chicago, Ill., succeeding C. S. McManus, resigned.

Erie.—F. W. Buskirk, Assistant General Passenger Agent at Chicago, will have charge of passenger interests in Chicago and west thereof, and R. H. Wallace, Assistant General Passenger Agent at Cleveland, will be in charge of the territory west of Buffalo and Salamanca to Hammond, Ind., and Cincinnati, inclusive. Also of the business from foreign lines south of the Ohio River.

Galveston, Harrisburg & San Antonio.—H. F. Anderson, heretofore Acting Superintendent of the Houston Division, with headquarters at San Antonio, Tex., has been appointed Assistant Superintendent of this Division.

Grand Trunk.—M. S. Blaiklock has been appointed Superintendent of the Eastern Division, with headquarters at Montreal, P. Q., succeeding W. G. Brownlee, effective March 20. Mr. Brownlee becomes Superintendent of the Western Division at Detroit, Mich., succeeding F. W. Egan, resigned, effective March 25.

Louisville & Nashville.—A. C. Hone has been appointed Master Mechanic of the Cumberland Valley Division.

Missouri Pacific.—Wm. Naughton has been appointed Acting Assistant Master Mechanic, with headquarters at Kansas City, Mo.

Northern Pacific.—J. M. Hannaford, heretofore Third Vice-President, has been elected Second Vice-President and T. Cooper has been appointed General Manager, succeeding W. G. Pearce, resigned. The following Division Engineers have been appointed: J. Q. Jamieson, Division Engineer, at Tacoma; F. S. Darling, at St. Paul, succeeding S. J. Bratager, transferred; W. C. Smith, Division Engineer, at Livingston, and B. E. Palmer, at Spokane.

Philadelphia & Reading.—W. A. Garrett, heretofore Division Superintendent at Philadelphia, Pa., has been appointed General Superintendent of the P. & R., and the Atlantic City, succeeding W. G. Besler, resigned.

Red River, Texas & Southern (St. Louis & San Francisco).—The officers of this company are: B. F. Yoakum, President; L. B. Comer, Vice-President and Superintendent; J. S. Jones, Secretary and Auditor; L. O. Williams, Treasurer; F. H. Hamilton, Assistant Secretary and Assistant Treasurer; N. H. Lassiter, General Attorney; W. A. Tuley, General Passenger Agent, and W. C. Preston, General Freight Agent.

Virginia & Southwestern.—W. R. Wills, Secretary and Treasurer, with headquarters at Bristol, Tenn., has resigned.

West Virginia Central & Pittsburgh.—J. W. Stearns has been appointed Engineer of Maintenance of Way.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—Preliminary surveys are reported in New Mexico for a line to run northwest from Roswell to a point near Belen, on the Santa Fe line, and from there to a point at or near Puerco, a total distance of over 150 miles.

Contract to grade seven miles of road between Big Blue Junction and Atherton, near Kansas City, Mo., has been let to L. J. Smith, of Kansas City. Two tracks are to be laid, and the line is to be used jointly by the Atchison, Topeka & Santa Fe and the Missouri Pacific.

BALTIMORE & OHIO.—The headings of the cut-off tunnel at Pinto, in Allegheny County, Pa., met March 20. The tunnel is 4,140 ft. long, double-track, and will save over 10 miles in heavy grade. The greater part of it is through solid rock.

BLACKWELL, ENID & SOUTHWESTERN.—Surveys are reported in Lubbock County, Tex., for an extension of this line toward El Paso. It is now being built to Vernon and preliminary surveys have been made from Vernon to Lubbock, which is about 150 miles southwest. The distance between Vernon and El Paso is over 400 miles by the proposed route.

CADIZ.—This line from Cadiz, Ky., to Gracey, 10 miles long, was opened March 15 and regular train service was inaugurated March 17. W. C. White is President, and D. L. Grinter, Vice-President, both of Cadiz, Ky.

CALIFORNIA ROADS.—The American Borax Co. has been granted a franchise for a railroad in San Bernardino County, Cal. The company is permitted to build a road which may be either narrow or standard gage, connecting various towns in the county. Any desired motive power may be used.

CENTRAL ARIZONA.—This company is seeking right of way through the San Francisco Forest Reserves in Arizona. It is at present in operation between Flagstaff and Mogollon, 11 miles. T. A. Riordan, of Flagstaff, is President, and F. W. Sisson is Treasurer. The Central Arizona is the successor of the Arizona Mineral Belt R. R., which was sold under foreclosure in 1888. In 1894 the rails of the lower part of the road below Mogollon were sold to the Santa Fe, Prescott & Phœnix.

CRESTON ELECTRIC RAILWAY, LIGHT, HEAT & POWER.—This company was organized in Iowa March 10, with headquarters at Creston, to build a series of electric roads in Nebraska and other States. It is intended at present to build from Creston, Union County, Iowa, to Winterset, Madison County, a distance of 30 miles. E. G. Baker, of Macksburg, Iowa, is President.

CHICAGO, BURLINGTON & QUINCY.—Surveys are reported in Nebraska locating an air line road from Plattsmouth to Lincoln, 54 miles. This is on the line of the Burlington & Missouri in place of the existing route, and is to be used exclusively for through passenger service if built.

New surveys are reported for the Big Horn Southern extension in Wyoming. A line is being run along the Wood River through Meeteese to Camp Kirwin.

CUMBERLAND & PENNSYLVANIA.—An officer writes in reference to new work reported between Piedmont and Keyser, W. Va., that a number of long passing sidings and yards for empty and loaded cars are being built. The work is being done by the company's own forces and no contracts are to be let. The distance between Piedmont and Keyser is about five miles.

DENVER & NORTHWESTERN.—This line, incorporated in June, 1901, as successor to the Denver, Boulder & Northern, is to be extended for 10 miles from Arvada, Colo., to Coal Creek Canyon. Contract was let last September for grading the first three miles between Berkeley and Arvada.

DULUTH & NORTHERN MINNESOTA.—An extension 20 miles long from a logging station west of Knife River, Minn., to Duluth, is reported located. This company has now about 50 miles of line in operation. General R. A. Alger, of Alger, Smith & Co., Detroit, the owners of the line, is President.

FRENCH BROAD & SOUTHERN.—This company was recently incorporated in South Carolina to build a railroad from Toxaway, Transylvania County, N. C., to some point on the Southern between the Changa and Seneca Rivers, Oconee County, S. C., with branches. The motive power may be either steam or electricity. The proposed distance is about 40 miles, and the incorporators are: J. T. Hayes, of Transylvania County, N. C.; J. Q. Marshall, of Columbia, S. C., and others.

GEORGIA, FLORIDA & ALABAMA.—An officer writes that the extension from Arlington, Ga., by way of Cuthbert and other towns to Columbus, Ga., a total of 90 miles, is under contract from Arlington to Cuthbert, 25 miles, to Davidson & Hardaway, contractors. Between eight and 10 miles of this northern extension has been graded, but no track has been laid as yet. An extension is also being built south from Bainbridge, Ga., to Tallahassee, Fla., 41 miles, for which the contractors are Saxon & Hanks, J. H. Davidson & Co., and B. H. Hardaway. About 40 miles of this extension is graded and track has been laid on it from Bainbridge to Attapulgus, 15 miles, and also for 12 miles out of Tallahassee. The work involves one bridge and a drawbridge which are practically completed. There are no more contracts to be let, and it is thought that the northern extension will be completed as far as Cuthbert by Aug. 1. After that it is likely that new securities will be issued for further extension of this branch.

GRAND RAPIDS & CHICAGO (ELECTRIC).—This company was recently incorporated under the laws of Michigan to build an electric line from Grand Rapids to Chicago by way of Kalamazoo, Allegan, South Haven and Benton Harbor, a distance of about 30 miles, passing through a thickly settled fruit and farming country. The incorporators are: W. H. Patterson, C. B. Kelsey and others.

GRAND TRUNK WESTERN.—Contract is reported let to the Flick & Johnson Construction Co., of Davenport, Iowa, for second track between Lansing, Mich., and Durand, 34 miles, and between Valparaiso and Haskell, 24 miles, on the line between Chicago and Detroit.

GREAT NORTHERN.—During the recent storms on Puget Sound the Great Northern suffered severely from land slides along its Pacific Coast line and the aggregate damage from more than 100 slides is estimated at $150,000. It is said that in places tracks will be moved to avoid future trouble.

HEARNE & BRAZOS VALLEY.—It is said that this line will be extended from Stone City, Tex., to Brenham, 40 miles, and that work will begin at once. The road is now in operation between Hearne and Stone City, 18 miles, and R. J. White, of Mumford, Tex., is President.

IDAHO NORTHERN.—It is said that this line, which was completed for 28 miles last year between Nampa, Idaho and Emmett, will this year be extended further northeast up the Payette River to the point where the north fork of the river joins the main stream.

INTEROCEANIC OF MEXICO.—Work is reported in progress shortening the line between the City of Mexico and Vera Cruz. When the cut-off is completed a saving of about 60 miles as compared with the existing route will be made, in addition to the reduction of grades.

INTERURBAN ELECTRIC (IOWA).—Amendments increasing the capital stock of this company from $50,000 to $550,000 were filed with the Secretary of State of Iowa March 10. The work of building the line from Des Moines to Colfax, about 20 miles, is to be pushed as rapidly as possible.

IOWA & ST. LOUIS.—The contract to build this line from Biddle, Mo., on the Atchison, Topeka & Santa Fe, to a point on the line of the Iowa Central, near Centerville, Iowa, and to the Chicago & North Western near Buxton, Iowa, was let, March 15, to Wm. Kenefick, of Kansas City. The contract calls for completion of the line by Aug. 1. The total distance will be about 60 miles.

IRON MOUNTAIN & GREENBRIER.—Contract to build this new road in West Virginia from a connection with the Chesapeake & Ohio at the White Sulphur Springs to Iron Mountain, on the North Fork of Anthony's Creek, a distance of about 25 miles, was let March 14 to Daniel O'Connell. The road is being built by the St. Lawrence and the Sherwood lumber companies.

KEWANEE, GALVA & WESTERN.—This company has been incorporated in Illinois to build a railroad eight miles

long between Galva and Kewanee. The names of the incorporators, who are all from Chicago, are not given.

LEHIGH VALLEY.—Announcement is made that all passenger service was resumed as heretofore on March 24. During several days prior to and including Feb. 28, the road in several places was severely damaged by freshets so that the service was temporarily reduced in order to handle the congested traffic on the main lines.

LOUISVILLE & NASHVILLE.—This company is reported to be building a branch four miles long from the iron works at South Boston, Ky., to Stony Fork, reaching coal properties.

MEXICAN CENTRAL.—It is said that this company will immediately extend the Zamora branch of this road in Mexico from Tinguindin, its present terminus, to Los Reyes, a distance of about 14 miles.

MEXICAN COAL & COKE.—The Mexican Government has granted this company an amendment to its concession of Nov. 28, 1899, for building a railroad from Mota del Cura to Baroteram in the State of Coahuila, a distance of 65 miles. The company is granted five years time from Dec. 10, 1901, in which to build certain lines to connect its gold mines with the Mexican Central, the Mexican International and the Mexican National railroads.

MEXICO ROADS.—The Mexican Government has just granted authority for the consolidation of the concessions held by Jose Garcia and Ernesto Diaz Rugama for building an extensive system of street railroads in the City of Mexico and to suburban towns. The consolidated franchise covers about 60 miles of streets and is considered very valuable. Work must begin within six months and be completed within two years. Animal or electric traction may be used. The concessionaires have deposited $25,000 of bonds of 3 per cent. consolidated public debt in the city treasury as a guarantee of the fulfillment of the terms of the concession.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—An officer writes in regard to extensions to the Missouri River and Aberdeen, S. Dak., currently reported in the press, that it is not expected that the company will build to either of these points during 1902.

MINNESOTA MIDLAND ELECTRIC.—This company on March 14 increased its capital stock from $100,000 to $300,000 with the purpose of building 25 miles of new road into a district at present without transportation facilities. It will haul freight as well as passengers.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—In regard to recent reports of land purchased at Martin, Tenn., an officer writes that a "Y" will be built at this point which is to be made a freight station, and that some additional track will be laid. The extent of the work has not yet been determined.

NORTH CAROLINA ROADS.—It is said that a standard gage line 10 miles long is to be built from Wilson to Stantonsburg, N. C., and that a 25-mile standard gage lumber road is also to be built out of Whiteville.

NOVA SCOTIA NORTHERN.—This company is asking incorporation to build a railroad from a point on the Eastern Extension line to a connection with the Oxford & New Glasgow. T. S. McMullen, of Truro, N. S., is interested.

ONTARIO ROADS.—The Ontario Government has been asked for a grant of a bonus of $3,000 per mile for a projected railroad between Morrisburg and Ottawa, 45 miles.

OREGON ROADS.—Surveys are reported in Oregon, near Columbia, for a new lumber road in the interest of the Bridal Vail Lumber Co. The survey parallels the Northern Pacific and crosses the line near the Columbia City station.

OREGON SHORT LINE.—This company has filed a map in the United States Land Office at Los Angeles showing the general location of its route. It will cross the Santa Fe line between The Needles and Mojava near Nerberry, and extend thence northeast to the Nevada line. Somewhat over 300 miles will be required to complete the Oregon Short Line to Los Angeles which, it is said, will be entered over the tracks of the Southern Pacific.

OTTAWA NORTHERN & WESTERN.—It is said that this company will extend its line from Gracefield to Maniwaki, Que., a distance of 30 miles.

OTTAWA, SPRING VALLEY & WESTERN.—This company was recently incorporated in Illinois to build a railroad from Ottawa, in La Salle County, to Princeton in Bureau County, a distance of about 32 miles, the greater part of which parallels the existing line of the Chicago, Rock Island & Pacific. The incorporators and first board of directors are: L. W. Johnson, F. W. Bedard, T. F. Doyle and others, of La Salle, Ill.

PENNSYLVANIA ROADS.—It is reported that a lumber road 15 miles long is to be built from lumber tracts in Fulton County to Richmond, Pa., to connect with the South Penn R. R., a distance of 15 miles.

QUEBEC SOUTHERN.—Sealed proposals will be received by H. A. Dodge, President of the South Shore Ry., until March 29, for building this line from St. Gregoire, in the County of Nicolet, Que., to a point east or west of Chaudiere River, Levis County, a distance of about 70 miles, and for the furnishing of all labor and material required up to formation level. Plans and profiles may be seen at President Hodge's office, Montreal, and at the Chief Engineer's office in Sorel. (Jan. 17, p. 50.)

ST. LOUIS BELT & TERMINAL.—This company was chartered in Missouri, Feb. 14, to build a belt line around the city of St. Louis connecting the Missouri Pacific and the St. Louis & San Francisco systems, and providing terminal facilities for them. The line will be 21 miles long, extending from Carondelet around the city to the Eads bridge.

SHAWANO & GREEN BAY INTERURBAN ELECTRIC.—This company was recently incorporated in Wisconsin to build a line 35 miles long between Shawano and Green Bay by way of Conduel, Pulaski and other towns. Franchises are now being asked. The road is designed to carry freight as well as passengers.

SHAWINIGAN FALLS TERMINAL.—This company is asking incorporation from the Government of Quebec for a railroad to run in the Counties of St. Maurice and Champlain, Que. J. E. Aldred, of Montreal; Vivian Burrill, of Shawinigan Falls, and others are interested.

SOUTHERN PACIFIC.—A special meeting of the stockholders of the New York, Texas & Mexican road, which is owned by the above, has been called for April 16 at Victoria, Tex. It is proposed to authorize an extension from the present terminus at Van Vleck to Bay City, Matagorda County, through the Caney Valley country. (Feb. 21, 1902, p. 138.)

An officer writes that contracts have been let to Robert Sherer & Co., of Los Angeles, for 9½ miles of line between Golconda and Iron Point, Nev., and to Grant Bros., of Los Angeles, for 15½ miles on from Iron Point to Stone House.

An officer writes in regard to the project of running a tunnel through the Sierras from the head of Donner Lake to the head of Yuba River, thence following the Yuba River to Bear River, and then into Lincoln, that nothing definite has as yet been decided.

SOUTH SHORE (CANADA).—See Quebec Southern.

TEXAS ROADS.—Surveys were reported begun by a large party of engineers March 17 for a railroad to run southeast from Corsicana, in the direction of Beaumont. It is said that the survey is being made to determine the feasibility of an extension for the Chicago, Rock Island & Texas from Fort Worth to Port Arthur, passing through the Beaumont oil fields.

TIFFIN & SOUTHERN (ELECTRIC).—Supplies have been ordered for the building of this new line from Tiffin, Ohio, to Kenton, by way of McCutchenville, Upper Sandusky and Marseilles. The line when completed will connect with the Tiffin & Port Clinton, which runs from Tiffin to Fremont, Fort Clinton and Lakeside, about 44 miles.

TULSA NORTHERN.—This company was chartered in Oklahoma March 14 to build a railroad 12 miles long from Tulsa, on the line of the Atchison, Topeka & Santa Fe in the Creek Nation, to Owasso, on the St. Louis & San Francisco in the Cherokee Nation. The incorporators are: F. H. McGuire and J. C. Foster, of Guthrie; Edward Short, of Tulsa, and others.

WABASH.—An officer writes in regard to reported purchases of new rails that orders were placed in December and January for rails for the Wabash, the Wheeling & Lake Erie, and the Pittsburgh, Carnegie & Western, aggregating about $1,750,000, the Pittsburgh line to be 90-lb. and the balance 80-lb. rails. About 300 miles of 80-lb. rail will be laid on the Wabash main lines, about 200 miles being laid west of St. Louis on the Omaha, Kansas City and Des Moines lines. Between St. Louis and Chicago enough will be laid to fill gaps so that it will be all 80-lb. rail between these two points. Twenty-five or 30 miles will also be laid on the main line east of Chicago; 90 miles of 80-lb. rail will be laid on the Wheeling & Lake Erie, and 60 miles of the Pittsburgh line will be double-tracked with 90-lb. rail. The grades between Bement and Chicago are also to be reduced to a maximum of 21 ft. per mile. Contracts for this work aggregating over $125,000 are being prepared and the work will be done during the coming summer. Contracts have also been let on the Western Division for 200,000 cu. yds. of broken stone ballast to be laid on the Omaha & St. Louis Division, and for 200,000 cu. yds. of burnt clay ballast.

WEST BANK.—The contract is reported let to Straub & Cheshire, of Helena, Ark., to grade 30 miles of this new line from Lake Village towards Vidalia, La.

WESTERN ILLINOIS.—This company was incorporated in Illinois March 15 to build a railroad from Dahinda, in Knox County, through the Counties of Knox, Stark, Marshall and Putnam. The incorporators are: L. B. Fuller, of Chicago; F. H. Holmes, of Galesburg, Ill., and others, and the company's office will be at Galesburg.

UNION PACIFIC.—It is said that a branch is to be built from Cedar Rapids, Neb., 15 miles northwest to Spaulding, passing through a grazing country. Work is to begin some time in April and be completed before autumn.

GENERAL RAILROAD NEWS.

BALTIMORE & SOUTHERN.—A bill has been introduced into the Maryland Legislature for the transfer of the charter and franchises for this road, commonly known as the Drum Point road, to other parties, unless the present owners of the charter shall build at least 20 miles before Sept. 1, 1902. The distance from Baltimore to Drum Point, which it is proposed to build, is 18 miles.

BROOKLYN RAPID TRANSIT.—A meeting of stockholders was held March 20 to authorize the proposed bond issue of $150,000,000. The representation of the capital stock was $39,192,600 present out of a total of $45,000,000 par value, and all of the shares represented voted in favor of the bond issue with the exception of 340. (Feb. 21, p. 138.)

BRUNSWICK & BIRMINGHAM.—The purchase by this company of the Offerman & Western R. R. is reported. The Offerman & Western extends for 35 miles from Offerman, on the Plant System in Georgia, to Nicholls in Coffee County. The new line, which is being built by the Brunswick & Birmingham, will reach Offerman in a short time and connect with this new section of the route toward Birmingham, Ala.

DETROIT & MACKINAC.—Holders of Certificates of Beneficial Interest in common stock, and in mortgage bonds or preferred stock of this company issued under the agreement of Jan. 10, 1895, for the reorganization of the Detroit, Bay City & Alpena, are notified that certificates of new stock of the Detroit & Mackinac will now be delivered in exchange for these outstanding certificates. In reference to the $750,000 of mortgage bonds held by the reorganization committee, it is announced that the committee has elected to receive preferred stock at par in payment and exchange for the entire issue, and also in payment for all of the interest due and accrued until Jan. 31, 1902, making in all $950,000 par value of preferred stock to be delivered among the holders of Certificates of Beneficial Interest. The holder of each certificate will be entitled to receive the par amount of such certificate in common stock, and also $47.50 in preferred stock of the Detroit & Mackinac.

GEORGIA RAILWAY & ELECTRIC.—This company was recently organized to consolidate all the trolley and electric light companies of Atlanta, Ga., including the Atlanta Railway & Power Co., operating 102.8 miles of line, and the Atlanta Rapid Transit Co., operating 24 miles. The capitalization will consist of an issue of $11,000,000 first mortgage 30-year 5 per cent. gold bonds, dated April 1, 1902, and subject to call at 110 on and after Jan. 1, 1907. This issue is to be variously applied to the retirement of the bonds of the component companies and for new work. There is also to be issued $1,800,000 preferred stock at 5 per cent., and $5,000,000 common stock.

HOUSTON & TEXAS CENTRAL.—A suit involving 4,000,000 acres of Texas oil lands was begun March 21 by certain shareholding interests in the Houston & Texas Central against the Central Trust Co. The suit was occasioned by the absorption of the Houston & Texas Central by the Southern Pacific, and complaint is made that foreclosure was unjustly brought against the smaller company, resulting in a fraudulent sale. The plaintiffs seek to have the foreclosure declared illegal and to be reinstated in their former rights to the land and other interests in the company.

METROPOLITAN STREET (NEW YORK).—At the meeting of the stockholders, March 20, to approve the proposition for an issue of $65,000,000 of bonds, as provided for in the plans of the lease to the Inter-urban Company, opposition was shown by a rather small minority vote which responded to the advertisements to Mr. Wormser, mentioned in a previous issue. The presiding officer declined to put motions for debate on the question and called at once for a vote, by which the lease was approved by 405,275 shares against 30,620 shares opposition. An injunction suit was subsequently entered against the lease by Mr. Wormser.

NATIONAL R. R. OF MEXICO.—This company filed articles of incorporation at Salt Lake City, Utah, March 14. The capitalization is placed at $63,350,000, with the stated object of building a railroad from Laredo, Texas, to the City of Mexico. Speyer & Co., according to reports, state that this is a step in the reorganization of the Mexican National.

NEW YORK & JERSEY.—A syndicate has been organized by Pemberton & McAdoo, 15 Wall street, New York, to underwrite $4,500,000 of bonds of this company, which started work some years ago, but subsequently discontinued it, and proposes to tunnel the North River independently of the Pennsylvania, having recently bought terminal property in New York City. (Construction Supplement, March 14, 1902.)

OAKLAND & EAST SIDE.—This company was incorporated in California, March 5, to take over the property of the California & Nevada R. R. The transfer is said to be in the interest of the Atchison, Topeka & Santa Fe. The California & Nevada was ordered sold under foreclosure in December, 1901. (Dec. 27, 1901, p. 900.)

PITTSBURGH, LISBON & WESTERN.—This property, which is a coal line 25 miles long, running from New Galilee, Pa., to Lisbon, Ohio, and which was chartered in 1896 as successor to the Pittsburgh, Marion & Chicago, has been taken over by Myron T. Herrick of Cleveland. The authorized capital of the company is $200,000, of which $150,000 has been issued, together with $150,000 worth of bonds. The road had never paid dividends but had put considerable earnings into betterments. N. B. Billingsley, of Lisbon, Ohio, has been elected temporary President. It is said that an extension of the line is contemplated.

ST. LOUIS SOUTHWESTERN.—In reference to the notice of Feb. 6, 1902, requesting holders of second-mortgage income-bond certificates, to deposit their certificates upon condition that these certificates might be returned upon advertised notice at any time before May 31, the further notice is given under date of March 13 that more than a majority of the outstanding bonds have been deposited. The company decided to extend the time within which these deposits may be made until March 27. It is specified that if these deposits are not returned, holders of receipts shall have the right to either receive new securities, or to sell their certificates for cash at 80 per cent. of their par value, plus accrued interest. (Feb. 14, p. 122.)

ST. LOUIS, WATKINS & GULF.—This company by agreement of a majority of the bondholders is to be formed as a reorganization of the Kansas City, Watkins & Gulf, which will be sold under foreclosure on April 4. The new company is to be capitalized with $1,225,000 of bonds and the same amount of stock. The Kansas City, Watkins & Gulf extends from Lake Charles to Alexandria, La., with short spurs, bringing the total mileage to 101. The net accumulated deficit June 30, 1900, was $330,512.

SAN LUIS POTOSI & POZOS.—This railroad, which runs from Rincon on the Mexican National, to the Pozos mining camp in Mexico, about 50 miles, has been acquired by the new National R. R. Co. of Mexico, and will hereafter be operated as a part of the Mexican National System.

TEXAS & NEW ORLEANS.—The Texas Railroad Commission on March 13 ordered to be registered bonds to the amount of $985,000 on 58 miles of completed road on the Dallas extension, from Huntington to Mahl, Texas, and from Athens, Texas, to the Neches River. The total amount of bonds which the Commission has authorized to be issued on the Dallas extension is $4,440,000, which is at the rate of $20,000 per mile for the 222 miles.

UNITED RAILROADS OF SAN FRANCISCO.—The United Railways Investment Co. is to own the entire outstanding capital stock of this company, which is a New Jersey corporation, and in turn will own or control the Market street lines which aggregate 177 miles, of which a portion is operated by cable, part by electricity and parts by steam and horse power. Of these lines the San Francisco & San Mateo operates 29½ miles; the Sutter street lines aggregate 13 miles, and the Sutro Electric Line is 10 miles long. In order to effect the acquisition, $35,275,000 general first mortgage 4 per cent. 25-year gold bonds are to be issued by the United Railroads of San Francisco; also $20,000,000 preferred stock and a like amount of common, the entire outstanding issue of each to be owned by the United Railways Investment Co. of San Francisco.

WESTERN MARYLAND.—Bids for the sale of the City of Baltimore's interest in this property were opened March 17 and four bids were received. McComas, Gaither & Greenbaum, representing the West Virginia Central and Gould interests, bid $8,509,819, and offered to bind the West Virginia Central & Pittsburgh to build the necessary connecting link to extend its line to tidewater at Baltimore. Steele, Semmes, Carey & Bond, representing the Reading Co., bid $7,004,098, and guaranteed to make the Western Maryland a part of their system and equip it independent of competing lines. Hambleton & Co. bid $10,000,000, of which part is to be cash and part is to be stock in the new company to be formed. They agreed to have a new company incorporated to be called the Western Maryland R. R. & Terminal Co., with a capital stock of $12,000,000. There was also a bid for $5,000,000 in cash, and $6,000,000 in income bonds from Wm. A. Varney, who asserted that no railroad company was interested directly or indirectly in the bid.